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AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

SEPTEMBER 18, 1937

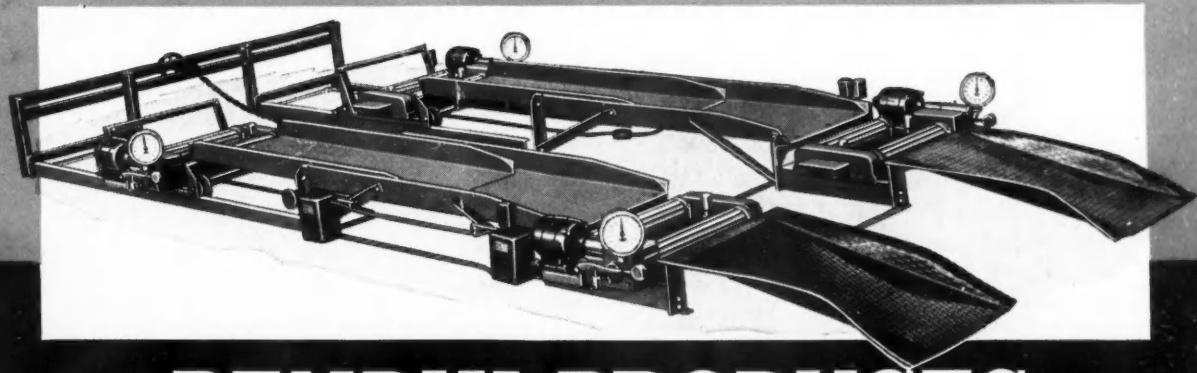
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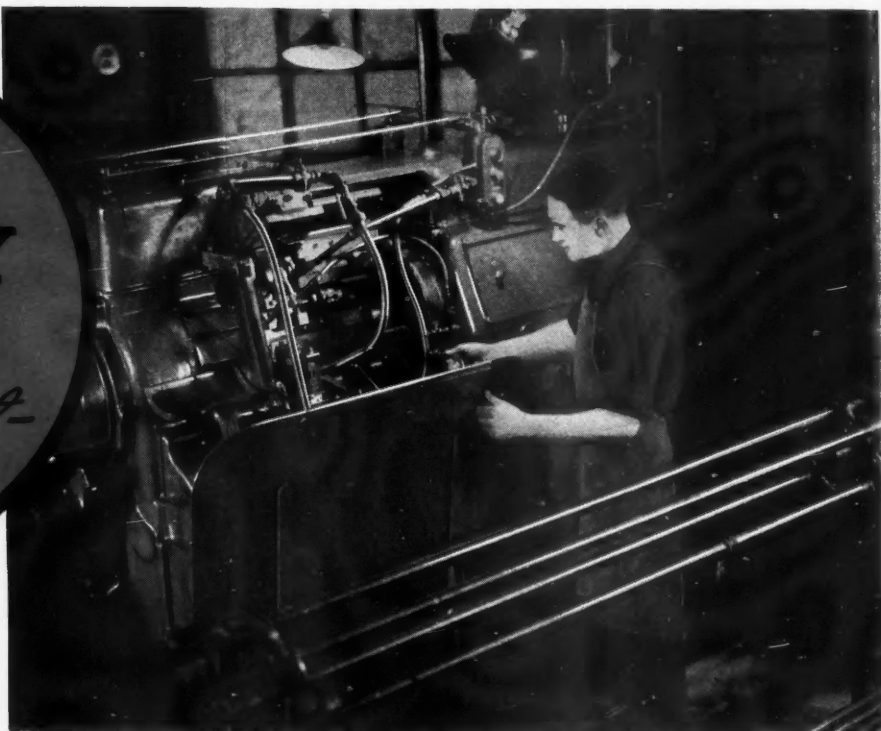
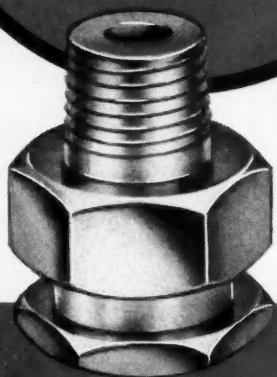
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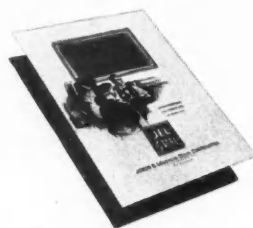
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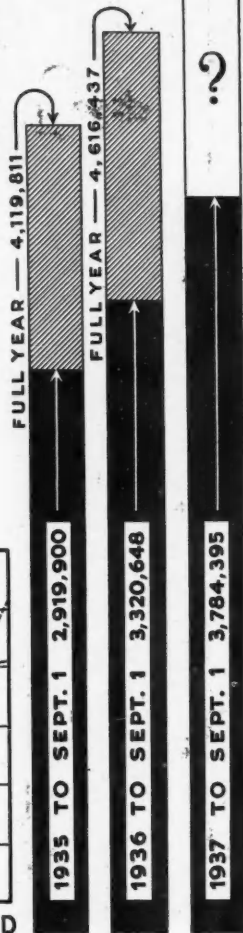
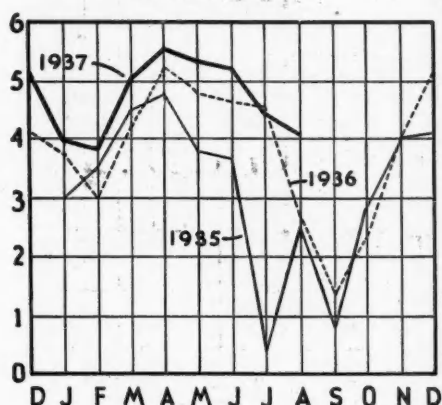
AUTOMOTIVE PRODUCTION*

Passenger Cars and Trucks —U.S. and Canada

Bar charts at the right represent total production to Sept. 1st of year indicated.

Numbers at left of monthly graph below show production in 100,000's.

*From Department of Commerce Report and Automobile Manufacturers' Ass'n.



Ideas in Zinc

With a number of 1938 model announcements breaking this month, it is of particular interest to note that one of the outstanding innovations for the coming season is the wide-spread adoption of remote control of transmission shifting. When the returns are all in it will be found that several car manufacturers feature the new controls. Apart from greater ease of making gear changes, by eliminating the wobble stick the new arrangement effectively cleans up the front compartment to take advantage of all available space. Now the front seat can accommodate three adult passengers without crowding, and in perfect safety.

Remote shifting control gives greater play to the stylist in the arrangement of units, as for example in the case of Studebaker, where the control is neatly faired into the instrument panel. In this and several other 1938 designs, the controls are effectively housed in high purity zinc alloy die castings. This application is particularly interesting because the die casting not only provides a means of expressing design form, but combines with appearance the desirable qualities of light weight, great strength and stability, as well as production economy.

This development will undoubtedly suggest many new ways for the automotive engineer to profitably employ the Zamak Alloys based on Horse Head Special Zinc of 99.99+ per cent purity. The New Jersey Zinc Company, 160 Front Street, New York City.

Idea No. 4

September 18, 1937

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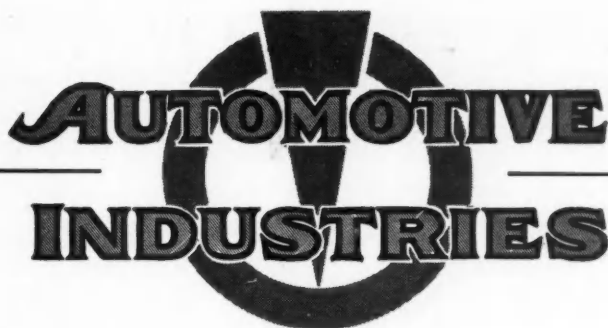
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Plants Busy on 1938 Production

*Old Model Season Closes; New Car Output Likely to be Small
For a Few Weeks; September Sales Well Maintained*

Plants are now rapidly falling in line on new car production. Among the recent ones to resume assembly operations are Pontiac, Oldsmobile, Hudson and Nash. Studebaker, Buick, Packard and Hupp were under way earlier. Pilot cars are coming down the assembly lines of other producers and during the coming week Cadillac, Lincoln-Zephyr and the various Chrysler divisions will be turning out 1938 cars. The Dodge truck plant assembly line of the Chrysler Corp. closed down Sept. 14 for inventory. It will reopen in two weeks.

Progress on production is always slow from the start until working forces become accustomed to the new cars and various manufacturing kinks are ironed out. Full production by most of these plants will not be reached until about Oct. 1. The few that started the first of the month have about reached full stride.

Output of the industry is now at the year's low point. Ford, Chevrolet and Graham finished up on 1937 cars this week, closing the old model year from a production standpoint. The two volume producers had kept the industry's output at a relatively high rate while other plants were retooling or feeling their way into new programs. Now that they are down and new models are not yet coming off the lines in volume, the next week or two will probably be the leanest of the year.

While assembly lines are just getting under way, other departments of the automobile companies are active and many have been all month, engaged in the manufacture of parts and sub-assemblies. Employment has held up well throughout the changeover period. For example, at the Plymouth plant, where peak employment at the height of the spring season was 77,000, employment dropped only to 41,000 workers at the low point during the changeover.

First reports on September sales show that deliveries are holding up well in the face of rapidly dwindling stocks in the field. From now on, sales are expected to work lower from week to week until out in October when dealer inventories will be replenished with 1938 cars and the upswing in the sales

cycle begins. The September retail volume is expected to drop to around 285,000 units from an estimated 356,000 units in August and 254,000 in September last year. The August estimate represents an upward revision on basis of late delivery requests.

There has been no official word on
(Turn to page 374, please)

Car Materials Soar

*1937 Costs Up Far More Than
Price Increases*

Proof that automobile company executives were entirely accurate when they said, upon increasing prices in August, that the advances did not cover higher costs, has been made available in a materials cost survey by the Automobile Manufacturers Association.

Not only have various materials gone up from 11 to 45 per cent, comparing July prices with the average prices for the year 1936, but in almost all cases, materials were far higher in July than on Jan. 1, 1937. The cost increases cover only materials and take no account of higher labor costs and tax increases, complete calculations on which will not be available until after the close of the year.

The increases in car prices ranged from 2.5 per cent for a large volume model up to 6.5 per cent on a medium priced model of another manufacturer. Unweighted for volume, the increases ran largely from 4.5 to 5.5 per cent.

The AMA has calculated that sheet steel as a class of material was 10 per
(Turn to page 374, please)

Nash to Build Trucks

Nash Motors division of Nash-Kelvinator Corp.'s re-entry into the truck field has been quite definitely settled as a policy, but arrangements have not been shaped for any definite announcement, it is understood. It is entirely likely that the operation will be set up in the main plant at Kenosha, and not, as has been rumored in recent months, in the idle Milwaukee plant. This is being used at present for warehousing Nash cars for water shipment to the East and for export.

Third Quarter Output to Top 1936 By 20%

Current quarter's production by the automobile industry will run about 20 per cent higher than for the corresponding period of 1936. Almost to the unit, as many vehicles were built in the first two months of the current period as in the entire third quarter last year, so that September's output is a clear gain. The three months' total this year should run in the neighborhood of 1,042,000 units, compared with 866,960 units for the period a year ago. This assumes a September output of 175,000 units, which at this point is regarded as a fair appraisal for the month, although no close estimate can be made because of the irregularities of initial production after model changes. The industry is reasonably certain of going well beyond its September, 1936, production of 139,820 units.

Studying Lights, Brakes

*U.S. Roads Bureau Discusses
New Designs for Safety*

Blinking headlight glare is "the most baffling problem" faced by design engineers in reducing the number of night highway accidents, according to the U. S. Bureau of Public Roads.

In its special report on highway safety and traffic conditions, the bureau reported to Congress that night accidents are much more numerous in proportion to traffic than day accidents despite the millions spent in research and improvements on headlamps and accessories.

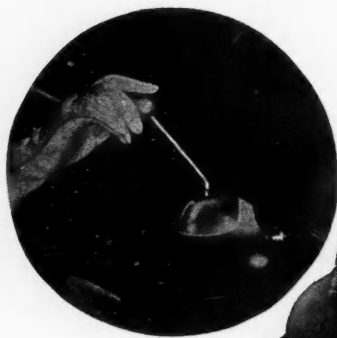
Referring to the present multiple-beam headlight with manual control by driver, the bureau conceded it to be "the best type available" but pointed out that drivers do not always use the proper beam and that there are many conditions of "gradient and curvature under which even a correctly adjusted beam will blind an approaching driver."

The report explained that polarized light beams, colored filters, magnetic or photo-electric operated beams are among the possibilities under consideration by designers for eliminating headlight glare. None of these, however, are

(Turn to page 374, please)

Studebaker Brings Out 1938 Cars

Bodies Redesigned for Room, Style; A Major Innovation is Remote Control Gear Shifting, Available as Option



FEATURE

of the new Studebaker line, President sedan of which is shown above, is the optional vacuum-mechanical gear shift. Dash mounting of the short gear shifting lever is illustrated at the left while the rear end treatment of the enlarged bodies is shown at the right.

Studebaker is announcing three new series for 1938, completely restyled as to the bodies and including several innovations intended to improve controllability and riding characteristics. The three cars are the President eight, on a 122-in. wheelbase, the Commander six and the Studebaker six, both on a 116½-in. wheelbase. Four body models, coupe, club sedan, cruising sedan and convertible sedan, are available in each series.

Among the major changes is the adoption, as optional equipment, of a vacuum-mechanical remote control gear shift, which permits the mounting of the 5-in. gear shift lever in a bracket which is set at the lower edge of the instrument panel, thereby clearing the floor. Shifting is said to have the same "feel" as with the conventional type. Mechanical details of the device will be found on pages 395 and 396 of this issue.

Bodies are 6 in. wider at the widest points than were the bodies on predecessor lines, allowing the installation of front seats 55½ in. wide, and rear seats 47¼ in. wide at the hips. The sedan is 65¼ in. high when loaded. Doors are wider at the bottom than at the top for easy passage.

Two features of front end design are the use of louver-less side panels for the hood and the placement of the headlights just inside the crown of the fenders and mounted on them. Headlights repeat the form of the radiator grille. The grille is far enough forward of the radiator that a winter front can be installed behind it. Stainless steel and chromium trim has been used.

All models have newly designed instrument panels and all windshields are 6 in. wider. "Phantom" steering wheel, twin sun visors, twin windshield clean-

ers and Tenite gear lever ball are standard on the President and Commander series.

Body redesign has made it possible to add considerably to luggage room. Sedans and club sedans average about 20½ cu. ft. of space and coupes have 36 cu. ft. Spare tires are carried in trunk compartments, and tool chests are under the luggage compartment floors. Special efforts were made to smooth the body contours.

Frames have been stiffened and lightened.

Steering ratios have been increased

and are variable to improve parking facility, while the steering arrangements have been altered to improve control. Brake sizes have been increased on all models.

In addition to the clearing of the front compartment through the use of the new gear shifting mechanism, the bulge there, caused by the transmission, has been eliminated by turning the transmissions on their sides, reducing the height. Overdrive is optional equipment.

Mechanical details of the cars will be found on page 394 of this issue.

Gets Franklin Patents

Air Cooled Motors, Formerly Doman-Marks, Buys Them

Air Cooled Motors Corp., Syracuse, N. Y., formerly the Doman-Marks Engine Co., Inc., has acquired the patents, trade mark and trade name of the H. H. Franklin Mfg. Co. and will hereafter designate its engines as "Franklin Aircooled Heavy Duty Engines." Lewis E. Pierson, Jr., president, and E. S. Marks, vice-president, explained that no other change has been made in the company, as stockholders, management, personnel and product are the same.

The announcement followed by only a few weeks sale of the Syracuse plant of the H. H. Franklin Mfg. Co. The plant was sold at public auction early in July to the Carrier Corp. after having been taken over by the city.

Mr. Marks and Carl Doman, who were chief engineer and experimental

engineer, respectively, for Franklin and later founded the Doman-Marks Engine Co., Inc., head the technical and production staff.

Former Franklin dealers have expressed interest in the new company setup and in its acquisition of the Franklin patents. As a large part of the sales activity of the company is in filling the demand for replacement engines in trucks and industrial equipment, it is said to be likely that the sales organization of the Air Cooled Motors Corp. will contain a considerable number of former Franklin representatives.

Plans Consolidation

American Brake Shoe and Foundry Co. is listing 10,316 additional shares of its common stock on the New York Stock Exchange. The shares will be used for the conversion of the outstanding shares of the American Brakeblok Corp. and of the American Manganese Steel Co., excepting shares already owned by the two companies. Objective is merger and consolidation of the two units, both now almost wholly owned by American Brake Shoe and Foundry.

URW Blocks Vote

*Goodyear Hours Referendum
To be Handled by Union*

Despite the absence of a collective bargaining contract, the United Rubber Workers Union of the CIO scored a significant victory in its first collective bargaining skirmish with management in the tire industry when it blocked an employee referendum scheduled for Sept. 15 by the Goodyear Tire & Rubber Co. of Akron, on a proposed "share-the-work" issue, and won the right to negotiate the issue through the Goodyear URW local. Goodyear Akron employees recently voted 8464 to 3193 in favor of the URW as the collective bargaining agency for all employees, but no collective bargaining pact with Goodyear has as yet been consummated.

Through the columns of its factory newspaper, *The Wingfoot Clan*, Goodyear announced, Sept. 10, that a choice between extensive layoffs or an indefinite continuance of the present share-the-work policy would be laid before Akron factory employees Sept. 15 in a company-conducted referendum. The issues to have been put before the employees were: 1—To reduce the present force to a point where remaining employees can get a fair week's work, or 2—To continue to share what work is available.

Goodyear URW officials immediately protested to President P. W. Litchfield of Goodyear that the scheduled referendum would be in direct violation of the Wagner labor relations act and claimed that the recent Goodyear employee vote favoring the URW as the sole bargaining agent, gave the union the right to negotiate the issue for all employees. Goodyear contended that the proposed company-conducted referendum came under the terms of the 1936 strike settlement which provided for an employee vote when hours were reduced below 30 per week. The URW sent a hurried appeal to the National Labor Relations Board and James P. Miller, regional NLRB director from Pittsburgh rushed to Akron. He held that the recent election won by

the URW at Goodyear gave it bargaining rights under the Wagner Act. As result, Goodyear canceled plans for the employee referendum and agreed to settle the issue by direct negotiation with the union.

The URW now has won collective bargaining rights at Goodyear and Goodrich factories in Akron and Los Angeles, and negotiations are in progress on collective bargaining contracts. The URW won the first Pacific Coast election at Goodrich in Los Angeles by a vote of 406 to 144 and carried the Goodyear Los Angeles election, Sept. 10, by a vote of 801 to 600.

Automotive Broadcasting Up

Analysis by industries of Columbia Broadcasting System time sales for June, July and August shows that automotive accounts gained 320.9 per cent over the same period in 1936. Billings

for the three months were \$840,986 against \$199,812 for 1936. Lubricants and fuels gained 44 per cent from \$330,177 to \$475,340. The gain in the automotive accounts was the largest for any industry surveyed.

Buick Raises Capacity

At a press preview of the 1938 Buick cars, Sept. 13, attended by more than 200 newspapermen from throughout the country, Harlow H. Curtice, president of the division, announced that Buick has expended more than \$10,000,000 in further plant extension and retooling for the new cars, looking to increased capacity for next year. A five-day week will be the basis in the manufacturing plants.

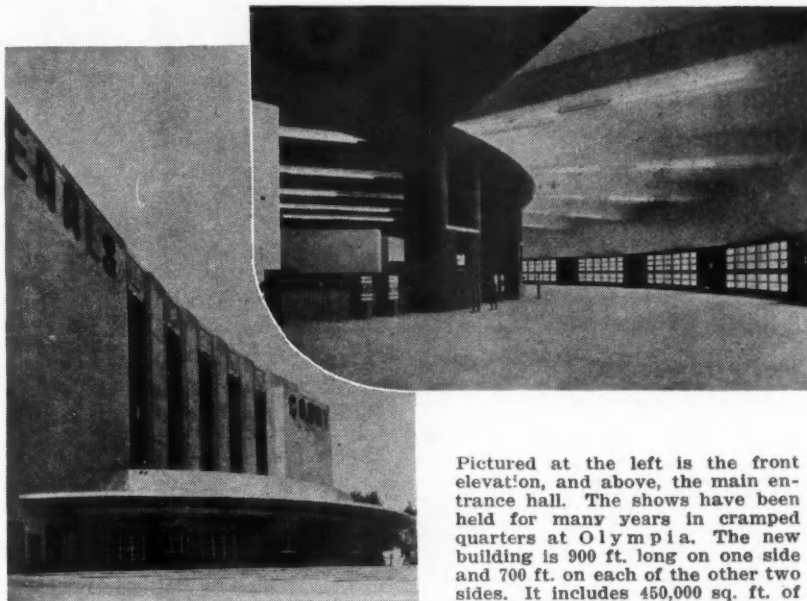
As a result the company now has an established capacity of 300,000 units a year, Mr. Curtice said.

Of the total additional expenditure of \$10,000,000, Mr. Curtice stated that approximately \$6,000,000 has gone for rearrangement and new equipment, with the balance going mostly for retooling, involving 425 pieces of new equipment.

"In addition to stepping up our production, to meet increased schedules," Mr. Curtice said, "the expansion program will eliminate Saturday and Sunday work in our factories, and give our employees more leisure time."

Build Racing Cars in Europe

Paris dispatches state that racing cars to comply with next year's international formula will be built by Mercedes, Auto Union, Maserati, Bugatti, Talbot, and Delahaye. It is not known if Alfa Romeo will build new cars, but if this manufacturer withdraws it is probable that Fiat will re-enter racing.



NEW LOCALE for the annual automobile show in London, England. This exposition hall, Earl Court, has just been completed and will house the show which begins Oct. 14.

Pictured at the left is the front elevation, and above, the main entrance hall. The shows have been held for many years in cramped quarters at Olympia. The new building is 900 ft. long on one side and 700 ft. on each of the other two sides. It includes 450,000 sq. ft. of exhibition floor area including one area 200 by 350 ft. entirely unobstructed by any columns. Special entrances and elevators are provided for trucks which bring exhibits so that they can be raised to the floor desired before unloading.



FRANCIS W. MAGIN, Industrial Controller Co., Milwaukee, division of the Square D Co., Detroit, maker of electric controlling devices, has been elected a member of the board of directors of the Hein-Werner Motor Parts Corp., Waukesha, Wis., filling a newly created seventh seat on the board.

P. C. DAY, authority on design of helical gears, and since 1910 chief engineer in charge of these activities for the Falk Corp., Milwaukee, has been elected a vice-president of the company. He will remain in charge of engineering. Mr. Day was for some years in charge of the West Drayton

Gear Works of the Power Plant Co. in England before joining the Falk organization.

W. W. McCLELLAN has been appointed to the sales engineering staff of the Grand Rapids office of the Lincoln Electric Co., Cleveland, Ohio.

W. E. ENGLAND has resigned as chief engineer of Willys-Overland Motors, Inc.

A. C. H. MARANNES, formerly engineer for General Motors Continental, has been transferred to General Motors Japan for assignment to the production department.



Studying Lights, Brakes

(Continued from page 371)

yet commercially practicable, it was said, but polarized light offers "some interesting possibilities."

Discussing the modern four-wheel brakes, the road bureau described improvements in drums, lining and operating mechanism as "greatly promoting highway safety." It added that "room for further progress" is found in increasing the life of brake linings and drums and in greater ease of adjustment and facility of operation. Specifically, it objected to the control of brakes and acceleration by the same foot and cited the time-lag necessary between the two operations which in times of emergency "may be important." It said that investigation of the chances for eliminating this defect should be "worthwhile."

Turning to the subject of "fading" (brakes becoming inoperative due to drum expansion during abrupt stops), the report said it is a condition that has not been wholly overcome but that it is now being remedied by better heat radiation from the drums and by approximately equalizing the expansion coefficients of the drums and shoes.

Busy on 1938 Cars

(Continued from page 371)

the Chrysler price policy. This was the only major producer who did not increase prices in August. Apparently, price increases, if they are made, will be effective on the 1938 lines.

H. E. G.

Willys-Overland Motors, Inc., will begin 1938 production about Oct. 1.

With its program of plant expansion in Kenosha, Racine and Milwaukee virtually completed, and almost doubling its capacity, the Nash Motors Division of Nash-Kelvinator Corporation began production of its new 1938 automobiles on Sept. 15. It was announced by Ray A. DeVlieg, general works manager. Starting on this date, the company will begin to reinstate the employees who have been inactive for several weeks while the expansion program has been going on, Mr. DeVlieg said. Employment in the Nash plants will reach its peak about October 1, when approximately 9500 men will be engaged in turning out the new 1938 models.

Domestic retail deliveries of Buick motor cars during August totaled 16,291 units, a gain of 4991 cars or 44.1 per cent over the corresponding month a year ago, it was announced by W. F. Hufstader, general sales manager. During the last ten days of the month, 4781 cars were delivered at retail in the United States compared with 2287 in the corresponding 1936 period, a gain of 2494 cars or 109 per cent.

TRACK

roller of unusual design used on the Indianapolis Speedway. It has fifteen tires and is loaded with several tons of sand, concrete and bricks. The purpose is to condition the asphalt-covered turns.

Hudson is in quantity production on its 1938 models which are the thirtieth annual series to be announced by the company.

Graham-Paige's retail deliveries in August totaled 1461 units against 1288 in August last year, an increase of 13.5 per cent. Advance reports indicate that retail sales for first ten days of September were at least as high as for the like period in August.

Establishing a new all-time record for sales during the first 10 day period of September, Oldsmobile dealers delivered at retail 3291 new sixes and eights. Total Oldsmobile sales for the year to date show a substantial gain over all previous years, said D. E. Ralston, Oldsmobile's general sales manager, in releasing the figures.

Hudson Terraplane Preview

At a preview of the 1938 Hudson 6 and Hudson 8 and Hudson Terraplane motor cars in Detroit, Sept. 13, plans for the coming year were outlined by President A. E. Barit and other Hudson factory executives.

Car Materials Costs Soar

(Continued from page 371)

cent higher on Jan. 1, 1937, than the 1936 average, and that it was 20 per cent higher in July. Forging steel, as a class of material, was 9 per cent higher on Jan. 1 and 17 per cent higher in July. Cast iron as a class was 7 per cent higher on Jan. 1 and 27 per cent higher in July than the 1936 average. These three groups of materials alone make up about half the materials cost of an automobile.

Materials used in a "hypothetical" car, as described by W. S. Knudsen, president of General Motors Corp, in an address at Wayne University in July, are made up as follows: steel 2800 lb., grey iron 400 lb., malleable iron 152 lb., lead 94 lb., copper 60 lb., zinc 30 lb., aluminum 10 lb., tin 5 lb., nickel 5 lb., crude rubber 223 lb., cotton 68 lb., plate glass 79 lb., cloth 16 lb., hair and padding 13 lb., mohair 2 lb., leather 1 lb., and paint and lacquer 33 lb.

The items which have risen most in percentage do not make up a very large

proportion of the car by weight, but the increases in the cost of steel and iron are important.

Latest indication that car producers have not yet been able to cut manufacturing costs to absorb the higher material and labor costs, and that prices will probably move still higher, was seen in a comment by Harlow H. Curtice, president of the Buick division of General Motors, at a press preview Sept. 13. Mr. Curtice said, "We are not yet ready to disclose our price structure but I can tell you that due to the increased cost of labor and materials the prices will have to be somewhat higher."

The extent to which car manufacturers were able during the 1937 season to offset materials cost advances by future purchasing cannot be determined since the practice varies widely.

Following is a table showing comparative prices of major groups of materials at Jan. 1 and July, against 1936 averages:

	Avg. 1936	Jan. 1, 1937	PC gain over 1936	July, 1937	PC gain over 1936
**					
Sheet steel	3.0	3.3	10	3.6	20
Forging steel	36.80	40.00	9	43.00	17
Cast iron	19.70	21.00	7	24.00	27
Wool	88.1	108.0	22	98.0	11
Rubber	16.5	21.3	29	19.0	15
Copper	9.5	12.4	30	13.8	45
Lead	4.7	6.0	28	6.0	28
Zinc	5.3	6.2	17	7.3	38

** Cents per lb. excepting for forging steel and cast iron, both of which are in dollars per gross ton.

Books

of automotive interest

The ABC of Trailing, by Ernest L. Dugas, 7-11 East 44th St., New York City.

This is a manual of information on trailer use. It recommends procedures for operation on the road and in camp and care of trailers, specifies needed equipment and reports on legal requirements such as licenses and speed laws in the several states. It contains lists of places where trailers can be parked and where such recreations as trailer owners would desire are to be found. It also contains cost sheets showing the expense of trailer trips.

German Research Reports

Three more issues of "*Kraftfahr-technische Forschungsarbeiten*" have been issued recently by the publishers, VDI Verlag, Berlin NW 7, Germany. No. 6 contains two papers on shaft couplings. The first, on universal joints, is by Professor K. Kutzbach, a noted authority on driving mechanism. It deals with the whole subject of universal joints on a fundamental basis and devotes considerable space to constant-velocity joints and to low-cost construction. This paper is accompanied by 118 illustrations. The second paper, on torsionally-flexible joints, is by Dr. Fritz G. Altmann.

No. 7 of the *Forschungsarbeiten* contains three papers, viz., "Equipment for an Investigation of the Scavenging Process in Small High-Speed Two-stroke Engines," by H. Kluge, K. v. Sanden, and W. Spannhake; "Investigation of Tooth Film Oil Pressures and Oil-Bath Lubrication of Gear Drives," by E. Heidebroek, and "Investigations on Two-Stroke Engines," by U. Schmidt. The last mentioned is the third report on a comprehensive research on two-stroke engines and deals specifically with the relation between scavenging and output in an engine in which scavenging is effected with combustible mixture.

No. 8 also contains three reports, the first being the fourth report on the two-stroke investigation by U. Schmidt and deals specifically with volumetric efficiency as a function of the speed. The second paper deals with calculation of the torsional rigidity of chassis frames, the author being O. Hofmeister, while the third is a "Contribution to the Development of the Quartz Indicator and its Application," by L. Bisang.

The three reports sell at 6, 3.50 and 3.50 marks respectively.

James H. McMahon

James H. McMahon, vice-president of General Motors Acceptance Corp., died at Bronxville, N. Y., Sept. 6. He



PROGRESS in a number of directions was reported to a nation wide series of meetings of General Motors dealers connected with Chicago by telephone hookup. Pictured are R. H. Grant, GM vice-president in charge of sales, Alfred P. Sloan, Jr., chairman of the board of

directors, and William S. Knudsen, president, who addressed the meetings from Chicago. They reported increased production capacity, promised dealers adequate field stocks by announcement time, and told of steps being taken to eliminate merchandising difficulties by territorial study of selling plans.

was born Nov. 5, 1874, in Syracuse, N. Y. Mr. McMahon began his business career in 1892 as auditor with the G. H. Hammond Co., of New York and Chicago. From 1902 to 1912 he was credit manager and auditor for the National Packing Co. At the dissolution of this firm in 1912, Mr. McMahon became credit manager for Armour & Co., remaining in this position until April 21, 1919, when he became associated with the executive offices of General Motors Acceptance Corp. as manager of credits and collections.

Arrange Paris Showings

American manufacturers who will exhibit at the Paris automobile show, October 7-17, include Nash, Hudson, Packard, Ford, Chrysler, Studebaker, Graham, Dodge and Fargo. Because of discrimination against American cars several years ago, General Motors continues to refuse to exhibit at Paris. Opel, however, German unit of General Motors, has a big stand in the center of the hall. German representation is strong.

Passenger cars, trucks, motor cycles, bicycles and accessories are included in this year's show.

The President of the Republic will pay an official visit to the show on October 8.

McKay Co. in Welding Field

The McKay Co., manufacturer of tire and industrial chains, and modern metal furniture, has announced the establishment of a new division for the making of shielded-arc welding electrodes.

L. E. Faulkner, widely experienced in the science of electric welding, is chief chemist for the new McKay plant. M. J. Van Dreser, who also has been prominently associated with the welding industry, is sales engineer in charge of the McKay electrode sales and service staff. T. J. McKay, Jr., is responsible for sales promotion and the coordination of engineering and plant activities with sales demands.

GM Building Field Stocks

Adequate stocks of all General Motors cars will be in the field at announcement time, it was disclosed Sept. 15 by R. H. Grant, vice-president in charge of sales, addressing dealer council meetings in 51 cities from Chicago by a telephone hookup. Alfred P. Sloan, Jr., chairman of the board of General Motors, who, as president in 1934, developed the idea which led to the founding of the dealer councils, addressed the meetings on the same hookup.

Mr. Grant reported to the meetings the progress the company has made in improving the conditions under which its dealers function and said that dealer profits for 1937 will be larger than for 1936. He said that a complete cleanup of 1937 cars is in prospect so that there will be no need for liquidation on the part of dealers. He stated that a great deal of work is being done on territorial layout with the idea of eliminating cross-selling. Minimizing of cross-selling will go far toward elimination of over-bidding on used cars, a problem as yet unsuccessfully attacked, he said.

President W. S. Knudsen, addressing the meetings, reported progress by all General Motors divisions during the year and said that the corporation will be able to handle 11,500 cars per day of eight hours during the coming season. He said an expansion program in the accessory divisions and in Chevrolet will be in operation the first of the year, and that the Diesel division is "loaded up with work in all directions." A new Diesel plant will be in operation in the spring.

Business in Brief

Written by the Guaranty Trust Co., New York

Business Unaffected

Despite sharp declines on the stock market and the increasing international tension growing out of the military activities in the Far East and in Spain, general business activity held up well last week. Business quarters generally regard the outlook for fall trade as favorable. Retail business made further advances under the impetus of seasonal buying.

Railway freight loadings during the week ended September 4 amounted to 804,633 cars, which marks a gain of 17,260 cars above those in the preceding week, a rise of 39,502 cars above those a year ago, and an increase of 212,692 cars above those two years ago.

Production of electricity by the electric light and power industry in the United States during the week ended September 4 was 8.6 per cent above that in the corresponding period last year.

Profits Gain Narrower

According to the Federal Reserve Bank of New York, net profits of 204 industrial and mercantile companies in the second quarter of this year were 18 per cent above those in the corresponding period in 1936. This is a smaller increase above a year ago than was registered in the first quarter of this year. Profits in the

second quarter were 21 per cent below those in the corresponding quarter in 1929.

Production of lumber during the week ended August 28 stood at 73 per cent of the 1929 weekly average. Output was 19 per cent larger than new orders and 17 per cent heavier than shipments.

Aggregate cash receipts of farmers from the sale of the leading farm commodities during July were larger than those in the corresponding period last year, according to the Bureau of Agricultural Economics. Increases were reported in five of the six geographical regions of the country, although there were sharp differences in income in the various regions.

Fisher Index Firm

Professor Fisher's index of wholesale commodity prices during the week ended September 11 stood at 91.2, as compared with 91.0 the week before and 91.7 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended September 8 showed no changes in holdings of discounted bills, bills bought in the open market, and Government securities. Money in circulation increased \$65,000,000, and the monetary gold stock rose \$37,000,000.

the situation is not so bad as painted by the automobile makers, and will assert that even if it were decided to admit sheets free from the United States the problem would not be solved, because American steel makers are six and eight weeks behind in meeting the domestic demand.

The motor industry is really not seeking a solution of that sort. Automobile makers would prefer to use Canadian steel, for they are proud of their record in meeting the present Canadian content requirement of 60 per cent, which mark will be raised to 65 per cent on April 1 next. It is probable the question will resolve itself into consultation between makers and users of black sheets with a view to increasing production.

Opens Detroit Office

The Mathews Conveyor Co., Ellwood City, Pa., has opened a sales-engineering office in Detroit. In addition, sub-agents are being located throughout Michigan. For the past twenty years the Mathews company has been represented in Michigan by the Palmer-Bee Co. primarily for the sale of roller conveyors.

Company Earnings

Twin Disc Clutch Co. reported for the year ended June 30 net income of \$354,455 or \$5.91 per share on the 60,000 shares, against \$259,244 or \$4.22 a share in the preceding year. Federal surtax was deducted from the net income.

Graham-Paige Motors Corp. reported for the quarter ended June 30 a net loss of \$493,511 against a net profit of \$10,891 in the preceding quarter and against a net loss in the June quarter of 1936 of \$30,408. For the first half of the year the company reported a net loss of \$482,620 against a net loss of \$216,648 for the like portion of 1936.

Automotive Metal Markets

Volume Steel Orders Still Lacking as Material for Only First Stocks is Bought; Molybdenum Used Instead of Tungsten

Automotive demand, restricted as it still is to a large extent to the buying of material for the manufacture of dealer's demonstration cars, nevertheless furnishes the only bright spot in the steel market. Some specifications for sheets and strip steel have been received from the Ford Motor Co. and several General Motors units, but regular suppliers look for much heavier releases over the next few weeks, sensing that for one reason or another the placing of tonnage commitments had to be postponed for a few weeks.

Automotive consumption in past years, when buying by other steel-consuming industries lagged, has frequently played the part of the bell-wether in bringing consumers generally back into the market and confidence that this will again happen this year is voiced by many steel marketers. A report of considerable interest comes from Buffalo. One of the steel producers in that district is planning erection of a large bar mill next year, with a view to catering chiefly to automotive consumers.

Round tonnage buying by representative automotive foundries is reported from Middle West pig iron markets.

Non-ferrous metals marked time while Wall Street was seething with excitement. Tin was in fair consuming demand at prices only fractionally below the 60-cent line. The market for spot Straits was quoted at 59½ cents at the beginning of the week and on Tuesday, as recovery took place in the securities markets, moved up to 59%

cents. The export price for copper held its own at 13.85 cents, with the domestic price unchanged at 14 cents. Producer-owned fabricating subsidiaries are the only buyers. Demand for aluminum is light, prices being unchanged. Secondary aluminum producers did a record-breaking business earlier in the summer, but the demand has receded sharply.

All quotations for future supplies in the tungsten market have been withdrawn, and the market is in a state of chaos. The last quotation for ore was \$35 per unit for shipment from China, about three times the normal level, but the quotation was characterized as entirely nominal and no offerings at any price were forthcoming. Some of the producers of tungsten alloy steels predict that further advances will be necessary, unless the situation in China takes a turn for the better in the near future. Meanwhile molybdenum is being more and more used as a substitute for tungsten. The United States has adequate resources of this metal.—W. C. H.

Steel Problem in Canada

On Sept. 20, automobile manufacturers will once more appear before the Canadian Tariff Board at Ottawa, Ont., but it will be to renew their complaints about the difficulty in obtaining certain raw materials and not to press claims for increased protection. The hearing to begin on Sept. 20 will deal particularly with the black sheet scarcity. Steel makers will contend that

... slants

WETTER WATER—Addition to water of a new synthetic alcohol made from waste gases from oil wells makes that water "wetter" than it was, according to papers recently read before the American Chemical Society meeting at Rochester. It gives the water the power of soaking almost instantly whatever it touches. The wet water is, of course, very useful in laying dust. It will also be of importance in a number of industrial procedures.

VERY SPECIAL BODIES—Among the orders for special bodies filled by Fleetwood recently was one from a widow who wanted a new Cadillac chassis with a body designed exactly like the one her late husband had given her years before. More often, the manufacturers get requests for particular dimensions. For instance, one tall man wanted to wear an opera hat in his car. That meant a roof four in. higher. A recent craze is responsible for the mounting of ski racks on several roofs. Etc.

THIS MAY HELP YOU—A huge relief map is planned for display at the 1939 Golden Gate International Exposition on San Francisco Bay. Occupying a space of approximately 100 by 150 feet, the map will show in contour the entire area of the eleven western states. Constructed accurately on the scale of

one inch to the mile, every depression and elevation in an expanse of 1,189,141 square miles will be depicted. Plans include the marking of paved and unpaved highways, oil and gravel roads, forest areas, streams and vacation spots on the relief. It is claimed that the map will also be of great service to highway departments in engineering new roads through mountainous territory.

DONE WITH MIRRORS—A simple visual method for determining whether your car's front wheels are out of alignment has been developed by a Floridian. Using a set of mirrors placed in front of the car, you can see by standing five or six feet from the car and looking directly at it whether the wheels are properly adjusted. The car is driven against blocks to be sure it sets correctly behind the mirrors and the tires are chalk marked for ease in sighting.

Ford Used Car Tune Up School

Ford Motor Company service men throughout the country will receive specialized training in used car appearance reconditioning in an instruction program established recently by the company's service department.

The school program ties in with the annual nationwide used car clearance sale of Ford dealers, in which a large percentage of the cars offered on sale are in the renewed and guaranteed class.

Newly developed devices used at the schools includes steam pressure equipment for cleaning metal parts, special upholstery cleaning fluids and brushes, vacuum cleaners, body bumping tools, welding apparatus, body and frame straightening appliances and painting materials.

40 Years Ago

with the ancestors of
AUTOMOTIVE INDUSTRIES

Alcohol As a Fuel for Motors

Experiments conducted in France to determine the relative merit of alcohol, kerosene and gasoline for power purposes, have produced the following results. Alcohol contains about half as many heat units as petroleum and evaporates less rapidly. In introducing alcohol into the motor, therefore it was necessary to make a number of changes. The motor was started with petroleum and alcohol was substituted when the exhaust had reached a certain temperature, and the proportions of the mixture were modified as twice as much alcohol as petroleum is required to produce an explosive mixture. Another method adopted was the use of a carburetor heated by gas and kept at a constant temperature, an expedient, however, which was found to be accompanied by considerable danger.

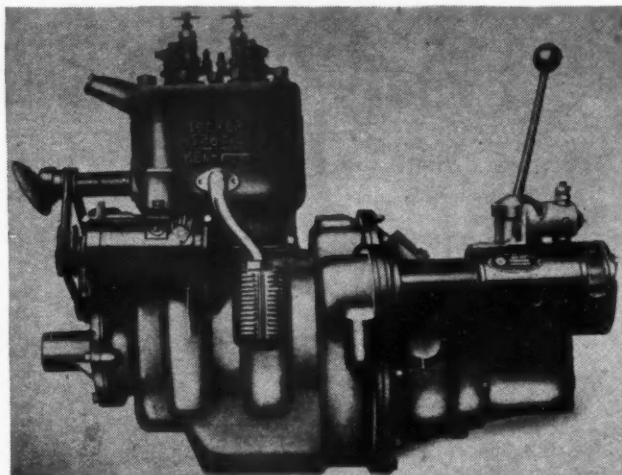
When economy of fuel was considered, alcohol was relegated to the rear, being over five times as expensive as kerosene for work done, and over three times as expensive as gasoline. When to this unfavorable showing is added the element of danger, we may dismiss alcohol as a fuel for motors.

From *The Horseless Age*, Sept., 1897.

Automotive Industries

DIESEL

of small size to be produced in volume by the Kokueki Automobile Co. of Japan. It is only 27 in. long including the gearbox. The overall height is 15½ in. The engine has two cylinders and the piston displacement is 44.3 cu. in.



Small Diesel in Japan

The Kokueki Automobile Company (successor to the defunct Welby Motor Company of Japan) is about to produce in quantity a small two-cylinder Diesel engine, which will be built into small passenger cars and trucks of the "Dat-sun" type as well as into motor carriers and tricycles known as "sanrinsha." It is remarkably compact, measuring only 27 in. in length (of which 12 in. is taken up by the gearbox), and 15½ in. in overall height. It has two vertical cylinders, each with a bore of 2.68 and a stroke of 3.94 in., so that the piston displacement is 44.3 cu. in.

Fuel is injected directly by a sprayer of special design, which is the object of a patent application, against an air pressure of 280 lb. per sq. in. The fuel pump is of Kokueki's own design. The engine, which is said to have a speed range of 250-3000 r.p.m., is rated 20 hp. at 2500 r.p.m. (This rating is probably rather optimistic, as it involves a b.m.e.p. of 140 lb. per sq. in.—Editor).

According to the manufacturers of the engine, an automobile or tricycle equipped with it can be operated at one-third the cost of a gasoline-engined vehicle of similar capacity, even when the higher first cost of the equipment is taken into account.

Brake Tester Developed

A deceleration gage known as the Decelometer and intended principally for use by filling-station attendants and operators, has been developed by R. J. Alden, vice-president of the Alden-Cowdrey Corporation of New York, in collaboration with engineers of the General Electric Co. and scientists of the National Bureau of Standards. In general appearance the instrument resembles a tubular two-cell flashlight. On its face are two small circular windows, one green, the other red. Inside is the working mechanism. On top of the case or shell is a small bubble-level which provides for proper positioning of the instrument.

During the testing operation, the Decelometer is placed on the floor of the car, directly in front of the inspec-

tor. A sharp set screw at the rear of the instrument holds it firmly in position, and prevents its being dislodged. When the brakes of the car under test are applied, the mercury in its channeled groove is thrown forward by its inertia, thereby effecting a mercury-switch action, and establishing contact with one or the other of the signal lights, operated by dry cells. If the forward motion is sufficiently fast to indicate proper braking efficiency, the mercury reaches the green signal; if not, the mercury reaches only the red signal. The instrument is calibrated to show whether or not the car can be stopped in 25 ft. from a speed of 20 m.p.h., which is the minimum requirement in many states having rigid brake-testing regulations.

Plant Notes

Numerous Expansions, Relocations Announced

The Morrison Steel Products Co., Inc., large producer of automobile truck panels, cowls and other steel parts, has purchased the \$500,000 plant of the American Lithographic Co. at Buffalo.

Jacob J. Morrison, president of the Morrison firm, in announcing the deal said expansion of the company from its present quarters was necessary because of the increase in business during the past year. Mr. Morrison said operations would get underway in the new plant by Nov. 15 with approximately 250 workers employed. The company will abandon its present location at that time.

Removal of the plant and general offices on September 1 of the American Grinder & Specialty Corp. from Milwaukee to Fond du Lac, Wis., is announced by E. Bockshe, president and general manager. The move was made, it is announced, because of increased sales which have made the need for expansion very acute, and also the desire to be located nearer its source of supplies.

Falk Corp., Milwaukee, Wis., manufacturer of open hearth steel castings, (Turn to page 381, please)

September 18, 1937

TOOLS OF TOMORROW

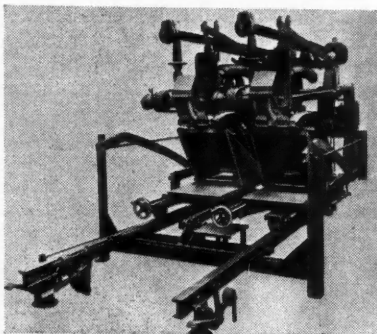
Bumper Polishing

... rocking table unit especially adapted to high curved bumpers

Excelsior Tool & Machine Co., East St. Louis, Ill., has brought out an improved automobile bumper polishing and buffing machine.

In operation, bumpers are reciprocated back and forth under the polishing wheels the required number of passes to obtain the desired finish. Two tables, on each of which two bumpers are mounted, operate independently.

The cam shaft is guided at each end by tool steel hardened guide rollers engaging the two channel iron side guides. By means of this arrangement the rocking motion is obtained to suit the curve of the bumper. Channel guides may be adjusted to the contour of different styles of bumpers.



Excelsior automobile bumper polishing and buffing machine

The machine is furnished with one set of fixtures for four bumpers plus dust spouts and motor to accommodate wheels up to 16-in. diameter and 6-in. face. Wheel speeds are 1900, 2200 and 2500 r.p.m.

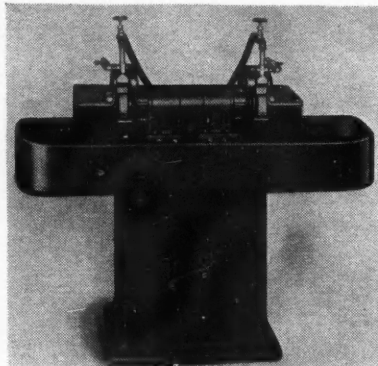
For roughing, the manufacturer recommends 80 and 120 grit abrasive at 1900 r.p.m. At 2200 r.p.m., 180 finishing and 200 greasing are suggested.

The only time the machine need be stopped is when wheels are replaced, otherwise the operation is continuous.

Wet Grinders

... Hisey-Wolf offers three sizes for 10-in., 12-in., and 14-in. wheels

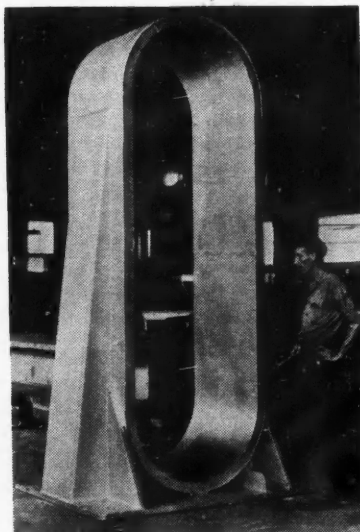
New two-wheel wet grinders are being offered in three sizes for 10-in., 12-in., and 14-in. wheels by the Hisey-Wolf Machine Co., Cincinnati, Ohio. As the manufacturer states, the decided advantage of a wet grinder is the elimination of dust.



Two-wheel Hisey-Wolf wet grinder

In these machines the same water is used over and over again. A separator removes all grit before returning the water to the reservoir. Flow of water is controlled by a valve on top of the guard.

The pump is self-priming and is driven by a vee-belt from the spindle. A reservoir in the pedestal is provided with a drain for convenience of flushing.



Hydraulic Presses

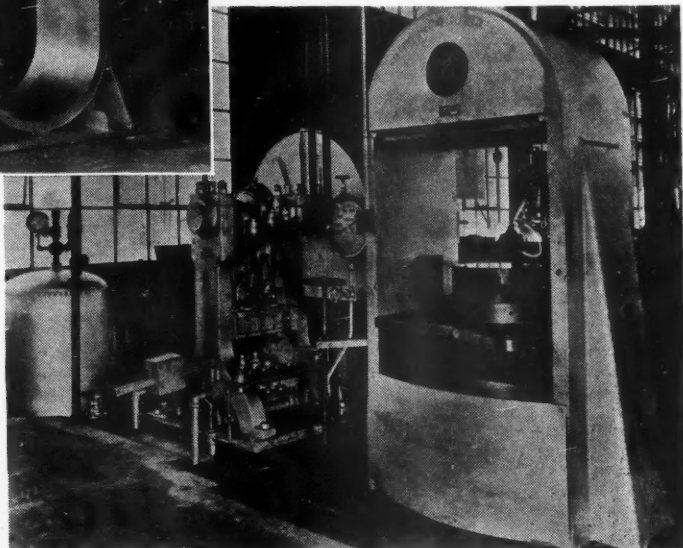
... with continuous-type welded frames by Lukenweld

Design details of several hydraulic presses with welded, continuous-type frames which have been placed in service in a number of automotive plants, were recently released by Lukenweld, Inc., Coatesville, Pa. Advantages of the continuous welded frame type of press are summed up by the manufacturer as follows: bending deflection of platen virtually disappears; uneven deflection of sides is eliminated; machining costs are reduced; first cost generally is reduced; maintenance costs are minimized, except those costs usually necessary in every hydraulic mechanism; and overall weight of press equipment is lessened.

One of these presses, with 1350 tons total working pressure, was installed several years ago in the plant of the S. K. Wellman Co., Cleveland, Ohio, manufacturers of molded and woven brake materials. The frame of this press weighed only 5380 lb.

The unit measures 7 ft. 11 1/4 in. high; 32 1/2 in. between the uprights. Its main strength members are two plates of special welding quality steel, measuring 112 1/16 in. in length, 30 in. in width, and 2 1/4 in. in thickness. They were formed into U-shape and joined to make the band by butt-welding the ends of the formed plates. Full strength welds were used since the welds must absorb the full tension load. The base and support for the frame proper consisted of seven other formed steel plates, welded to the band. When completed, the entire frame of the press

(Left) A welded continuous type frame, designed and fabricated by Lukenweld, Inc., for a 2000-ton hydraulic press built by Stewart Bolling & Co., Inc. (Below) A 2000-ton hydraulic press with the welded continuous type frame installed in automotive plant.



was thoroughly furnace stress-relieved to eliminate all residual stresses which may have been developed in welding.

The design of the press frame is such that the steel is used in tension only. Mechanical requirements of load distribution from the bottom of the hydraulic cylinder to the steel hoop were met by the use of semi-circular slugs of cast iron in compression.

As stated by the manufacturer, the type of construction used in this press minimizes the curvilinear type of deflection. The curvilinear type of deflection is detrimental to dies or other equipment that depend for support on the rigidity of the platens. The only type of deflection said to be exhibited by this press is a straight tension elongation of the side members, which is an

(Turn to page 400, please)

Spicer Plant Reopens

Spicer Mfg. Corp., Toledo, plant operations have returned to a normal basis following a strike called by the Mechanics Educational Society following disappointment over the amount of a wage increase. The strike was called despite the winning of a plant election by Local No. 12 of the United Automobile Workers of America. MESA members picketed the plant for several days and prevented operations but it reopened on Sept. 13 and by Sept. 15 the MESA picket line melted away when 4000 UAW members from Electric Auto-Lite, Willy-Overland and other plants appeared in a demonstration. Homer Martin, president of the UAW, addressing a meeting of Spicer workers, called the strike one "against a union and not against prevailing working conditions." He urged the upholding of contractual relations and a solid front by the union. The UAW has a contract with the company.

GM Begins Inland Plant

Ground-breaking ceremonies for the new plant of the Inland division of General Motors in Clark township, N. J., were held Sept. 8, before nearly 100 county and township officials and corporation and divisional executives of General Motors. It was announced that the general contract for the construction of the plant had been awarded Andrew Christensen of Elizabeth, N. J. Work will be started at once, with completion scheduled around the first of the year.

Rim Inspections

Rims inspected and approved by the Tire and Rim Association, Inc., in August totaled 1,020,480 in sizes 16 in. and under. This was 76 per cent of the inspections, and compared with 542,150 or 58 per cent for the same month last year. Inspections of 17-in. and larger rims amounted to 13,901 or 1 per cent of the total inspections, against 104,439 or 11.2 per cent a year ago. Inspections of 20-in. truck rims numbered 251,667 or 18.7 per cent of the total, against 238,467 or 25.5 per cent last year.

APEM Indexes Dip

Automotive Parts and Equipment Manufacturers, Inc. index for the four weeks ended July 24 showed declines from the figures for the preceding period, but gains over the figures for the like period of the preceding year.

The employment index (40 hour) for 48 original equipment plants stood at 119 against 127.3 for the June period and against 95.8 for the Ju'y period last year. The 42-hour index was 126.7 against 128.9 and 112.6 respectively. The 40-hour production index was 80.3 against 83.8 and 67.4, while the 42-hour index was 87.6 against 83.0 and 82.3 respectively.

Pratt & Whitney Licenses

Pratt & Whitney Aircraft division, United Aircraft Corp., has licensed Commonwealth Aircraft Pty., Ltd., of Melbourne, Australia, to manufacture the Pratt & Whitney Wasp engine.

According to a recent announcement, all the equipment for the aircraft factory of Commonwealth Aircraft Pty., Ltd. at Fisherman's Bend, Melbourne, Australia, has been purchased and will be installed immediately. The engine factory is completed and the administration office buildings are nearing completion. Wing Commander Wackett and several others of the company's technicians have been abroad investigating aircraft construction.

Japanese "SAE" Proposed

An organization of automobile engineers in the Japanese Empire will be an accomplished fact before long. The new body will be named the Scientific Society of Automobile Engineers, and will be headed by Dr. Kazuo Kumabe, professor at Tokyo Imperial University.

In view of the composite nature of the automotive industry, many engineers have already associated themselves with various scientific organizations, such as metallurgical, aeronautical and mechanical societies.

The new society will, therefore, be in the nature of a "roof" organization. It is further planned to organize sub-groups for body, chassis, gasoline engine and Diesel engineering.

UAW Wins at City Auto

United Auto Workers Local No. 12 won both sections of a vote at City Auto Stamping Co. at Toledo, Sept. 9, under the auspices of the National Labor Relations Board. Vote of the production and maintenance workers was 403 to 23 for the auto workers and among metal polishers was 37 for UAW and 33 for AFL polishers union.

Consolidates Divisions

Following removal of all plant operations of its subsidiary, the Oldberg Mfg. Co. to Grand Haven, the Michigan Bumper Corp. has established its combined engineering division in new quarters at 7573 West 8 Mile Road, Detroit. This division is under the direct supervision of Floyd Deremer.

Many Patents Taken in 1936

Total number of patents granted in 1936 was 39,793 exclusive of reissued patents and design patents. Fourth largest taker of patents was General Motors Corp. which was granted 263. Bendix Aviation Corp. was granted 65. International Harvester Co. 47. Chrysler Corp. 44 and Bendix Brake Co. 33. General Electric Co. was granted the largest number, 476. Union Carbide and Carbon Corp. was granted 71.

Buying Power Improves

Commerce Department Views

Sales Outlook as Good

Optimistic expressions on the part of a number of automobile company executives that sales of 1938 models will be fully as large as total sales of 1937 models find support in the expression of the Department of Commerce's September survey that purchasing power has risen quite steadily. The various sources of buying power for new automobiles, trucks and tractors have all experienced an upturn this year, said the survey.

The department reported in part, "The available data indicate an increase of between 10 and 15 per cent in the national income distributed during the first 8 months of the year in comparison with the corresponding period of last year. This indicates a further increase in real income, since the rise in living costs, resulting from higher commodity prices and the improvement in the rental situation, has been less than the increase in aggregate income.

"The expansion in the national income distributed has reflected the sharp gain in labor payments, the further rise in income derived from agriculture and other business enterprises, and the rapid increase in dividend payments. The further rise in purchasing power is of major significance with reference to both the current and the prospective volume of business. While the increase in factory pay rolls this year has been outstanding, it may be noted that total labor income has been estimated at nearly 15 per cent higher than last year. Dividend payments, according to Moody's index, which is indicative of the general trend, have increased by more than one-third.

"Not only labor and property incomes have been rising; the income of the farmer also has continued to increase. The outlook for the fall harvest is good, according to the Department of Agriculture, with present prospects indicating a yield above average for the principal crops and much above last year's drought-reduced yields.

"The Department of Agriculture estimates, on the basis of current prospects as to sales and prices, that cash farm income from marketings and Government payments for the year 1937 will be \$9,000,000,000, compared with \$7,865,000,000 in 1936, an increase of 14 per cent. This would represent the largest total since 1929, when the income was \$10,479,000,000. In terms of purchasing power, the comparative showing with respect to 1929 is much better because of the lower level of prices of goods which farmers purchase. The Department of Agriculture's index of prices paid by farmers, for example, for the first 7 months of this year was 9 per cent below the average for the year 1929. The income will also be more evenly distributed this year than in recent years.

AUTOMOTIVE ABSTRACTS

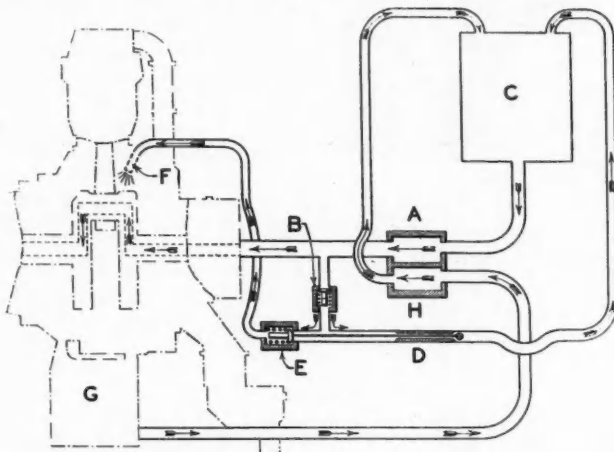
Lubrication of Cold Engines

A system of engine lubrication which is said to make it unnecessary to warm up an aircraft engine for an extended period before taking off has been developed by The Bristol Aeroplane & Engine Co., England. A diagrammatic illustration of the system is shown herewith. Under normal operating

conditions oil is supplied to the engine bearings by means of a pressure pump, the oil entering at the rear end of the crankshaft. The main relief valve is set to maintain the pressure at 30 lb. per sq. in. with the oil at 158 d. g. F. Oil by-passed through the relief valve returns to the oil tank under its own pressure. It will be noticed that a "restrictor" is inserted in the oil return line to the tank, this restrictor being so designed that under normal operating conditions it will pass all of the by-passed oil without setting up any very high pressure. However, when the oil is cold, owing to its much higher viscosity and as a result of the fact that more oil is then by-passed, a much higher pressure will be generated in the line. When the pressure in the relief line attains 55-60 lb. per sq. in., the sprayer valve is opened, and oil is then sprayed directly onto the crank-pin bearing. This continues as long as the oil delivered by the pressure pump is sufficiently cold and viscous, and then stops automatically.

A schematic drawing of the Bristol lubrication system

- A—Pressure Pump
- B—Main Relief Valve
- C—Oil Tank
- D—Restrictor
- E—Sprayer Valve
- F—Sprayer
- G—Sump
- H—Scavenge Pump



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In practice the sprayer valve and the restrictor are incorporated in a sleeve valve, which enables the quantity of oil passing to the sprayer, as well as the oil tempera-

ture at which the oil spray is automatically cut out, to be governed. With the exception of an additional line to the oil tank the system adds nothing to the conventional installation. As to its efficacy, it is stated that in flight tests with the oil in the engine at below the freezing point, the throttle was opened wide immediately and the plane was off the ground in an average of less

Tomizuka's Electric Pressure Indicator

Dr. Kiyoshi Tomizuka, of the Aeronautical Research Institute of Tokyo Imperial University, attracted considerable engineering attention back in 1928, when he first demonstrated an instrument of his own design which automatically indicated and recorded the compression changes in cylinders of high-speed internal combustion engines. The device has since been improved in various directions.

The instrument, as described in Dr. Tomizuka's latest patent application, con-

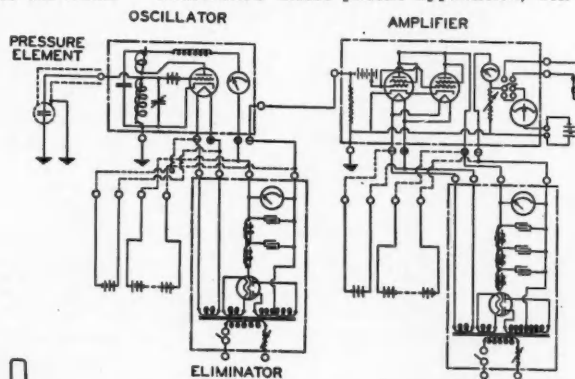


Diagram of electrical circuits of the Tomizuka pressure indicator

sists of seven parts, namely, a pressure element, an oscillator, an amplifier, a battery, an indicator, a shielded wire, and an oscillograph. The features of the device are the wiring system and the simple construction of the pressure element.

Owing to its small size, the pressure ele-

ment—the vital part of the instrument—can be applied to any cylinder. It is water-jacketed and it has no mirror or similar device. The diaphragm acts also as a spring and its thickness can be readily changed to meet different requirements.

The instrument has been successfully applied to researches of various kinds. Studies have been made with it of the pressure variations in inlet and exhaust lines of internal combustion engines. Similarly, the pressure variations in the fuel lines of injection engines could be studied by means of the instrument. Other possible applications include an investigation of the effect of superchargers on automobile and aircraft engines, the development of the combustion phases in Diesel and gasoline engines, and, finally a study of the variations of air pressure in automobile and airplane tires under peak-load conditions as when automobile tires pass over an obstruction or when the airplane tires hit the ground in landing.—Kogyo Zasshi (Industrial Journal), Tokyo.

NADA Dealer Profits Off

Combined total dollar volume of retail sales in all departments of 649 reporting NADA dealers for the first half of 1937 amounted to \$165,578,821 compared with \$158,210,599 for the same period in 1936. Total operating expenses jumped in 1937 and were 111.44 per cent of the first six months in 1936.

Total operating profit for the reporting dealers for the first six months of 1937 was \$5,559,236 compared with \$5,688,988 in 1936. Due to clean-up sales and over-trading on used cars operating profits generally are considerably less in the latter half of the year.

New motor vehicles on hand June 30, 1937, were only 94.59 per cent of the total on hand the same date in 1936. The average was 27 new units per dealer as against 29 last year for the same date.

Used motor vehicles on hand June 30, 1937, were reported as 106.55 of the 1936 figures. Average unit used car stock per dealer was 46 as of June 30, 1937, or about 30 days supply.



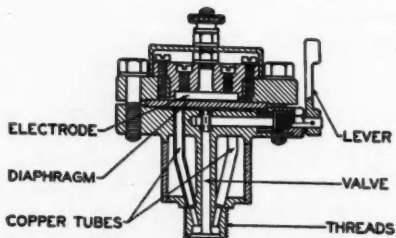
A circular, describing the new Type S hobbing machine, manufactured by the Barber-Colman Co., Rockford, Ill., has been issued by the company.*

Dardelet Threadlock Corp. has published a folder, second in a series of eight or ten, dealing with groups of applications of the company's product. The folder deals with uses on cap and set screws.*

Eisler Engineering Co., Newark, N. J., has issued a catalog, No. 38W, on its electric spot and butt welding machine. There are 100 pages and 1250 illustrations.*

United States Steel Corp. has published a new booklet entitled "USS Cor-Ten—The Low-cost, High-strength, Corrosion-resisting Steel of Many Uses." It is illustrated and contains data tables. A feature is a bibliography of technical references.*

A new catalog describing the Lee direct fired unit heater has been issued by the



Sectional view of pressure element

Dravo Corp., machinery division, Pittsburgh.*

National Broach & Machine Co. has issued bulletins on "Naloy," on "Broaching," on "Red Ring Lapping Compounds" and on Red Ring Equipment for Shaving, Lapping, Checking and Sound Testing Gears.

September issue of *Nickel Cast Iron News* contains a number of items on automotive uses of the product.*

Link-Belt Co., in the September issue of its publication, the *News*, describes the hydraulic system of cleaning castings.*

Ajax Flexible Coupling Co. has published a new catalog of its products. It is illustrated and includes data on applications.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Plant Notes

(Continued from page 377)

herringbone gears, industrial and marine transmission drives, etc., has acquired two buildings of the former National Brake & Electric Co. group at Milwaukee, and is dismantling them for re-assembly on its own plant site at South Thirtieth and West Canal Streets, for concentration of all of its welding operations, now scattered among available space in its foundries and machine shops. One building is 114 x 308 ft., and the other 150 x 200 ft.

Air Reduction Sales Co., Milwaukee, Wis., has announced that it will enlarge the plant of its subsidiary, Pure Carbonic Co., in West Allis, suburb of Milwaukee, at an estimated cost of \$75,000 for buildings and equipment.

Letters

to AUTOMOTIVE INDUSTRIES

Wants Racing News, Praises Heldt

Inasmuch as you have requested an expression of opinion from various members of the engineering fraternity, I wish to go on record as emphatically approving the policy of publishing as much data and news as possible pertaining to the racing field. We, of the automotive engineering fraternity, are vitally interested in all developments that occur in the racing field. It would also be very interesting to hear more about the development and construction problems encountered by the racing people. It might be appropriate to mention here that, among the most interesting of all the talent appearing on the Society of Automotive Engineers local and national programs has been a distinguished member of your own staff, Mr. P. M. Heldt.

Among automotive engineers, Mr. Heldt is regarded as one of the keenest analytical minds and is one of the finest technical writers appearing in current technical literature. We follow closely all of his articles in *AUTOMOTIVE INDUSTRIES* and always look forward to attending the national meetings held in Detroit, an important part of which is Mr. Heldt's presentation.

N. E. MILLER,
Detroit, Mich.

Samuel H. Smith is manager at Milwaukee.

Slate of Wisconsin Highway Commission expects to start work soon on a combined highway research laboratory and signal and sign manufacturing plant on the campus of the University of Wisconsin.

Signal Electric Mfg. Co., Menominee, Mich., will build a 2-story factory addi-

tion, 40 x 150 ft., designed by Derick Hubert, local architect.

Spring City Foundry Co., Waukesha, Wis., has placed contracts for the construction of a 4-story core room and pattern storage unit, 55 x 75 ft., to release space in present structures for larger production of cylinder castings and other gray iron castings.

Twin Disc Clutch Co., Racine, Wis., has started operations in its newly established branch works at Rockford, Ill., which will be devoted exclusively to tractor clutch manufacture. Approximately \$150,000 has been invested in buildings and equipment at Rockford.

Ford Backs Park Films

Announcement was made by Arno B. Cammerer, director of the National Park Service, that the Ford Motor Company will finance motion pictures in color of two of the most spectacular of the national parks of the West, Zion and Bryce Canyon, Utah. Cedar Breaks National Monument, adjacent to these two parks and closely related geologically to their formation, probably will be included in the project. Black and white films, as well as colored, will be made.

August Car, Truck Sales

Reports on new passenger car sales in the United States in August are running 12.52 per cent higher than in August, 1936. R. L. Polk & Co. stated. Sales in the first 11 states reporting totaled 40,134, a decrease of 17.88 per cent from the month of July. On this basis the Polk company estimates August sales at 298,000.

Truck and commercial car sales for August are estimated at 62,000. Ten states reporting to date disclose 7800 sales. This figure is 3.39 per cent ahead of July sales in ten states and 4.63 per cent ahead of August a year ago.

Calendar of Coming Events

DOMESTIC SHOWS

New York, National Automobile Show, Oct. 27-Nov. 3
Toledo, O., Automobile Show, Oct. 27-Nov. 3
Boston, Mass., Automobile Show, Oct. 30-Nov. 6
Washington, D. C., Automobile Show, Oct. 30-Nov. 6
Los Angeles, Cal., Automobile Show, Oct. 30-Nov. 7
San Francisco, Automobile Show, Oct. 30-Nov. 6
Cincinnati Automobile Show, Oct. 31-Nov. 6
Akron Automobile Show, Nov. 6-12
Brooklyn Automobile Show, Nov. 6-13
Chicago Automobile Show, Nov. 6-13
Columbus Automobile Show, Nov. 6-12
Omaha Automobile Show, Nov. 6-11
Detroit Automobile Show, Nov. 6-13
Motor Truck Show, 4th Annual, Nov. 6-12
Newark, N. J., Truck Show, Nov. 6-12
Buffalo, N. Y., Automobile Show, Nov. 6-13
Indianapolis, Automobile Show, Nov. 6-13
Newark, N. J., Automobile Show, Nov. 6-13
Philadelphia Automobile Show, Nov. 6-13
Pittsburgh, Pa., Automobile Show, Nov. 6-13
Baltimore, Md., Automobile Show, Nov. 13-20
Cleveland, Ohio, Automobile Show, Nov. 13-20
Rochester, Automobile Show, Nov. 13-20
Springfield, Mass., Automobile Show, Nov. 14-20
St. Louis, Mo., Automobile Show, Nov. 14-21
Portland, Ore., Automobile Show, Nov. 14-21
Denver, Colo., Automobile Show, Nov. 15-20
Jersey City, N. J., Automobile Show, Nov. 15-20
Milwaukee, Wis., Automobile Show, Nov. 17-24

SHOW BUSINESS

Manager of the National Automobile Show in New York is Alfred Reeves, 366 Madison Ave., N. Y. C. Inquiries concerning all matters connected with the national show should be addressed to him. *AUTOMOTIVE INDUSTRIES* will be pleased to furnish names and addresses of local show managers on request.

Kansas City, Mo., Automobile Show, Nov. 27-Dec. 4
A.S.I. Show, Navy Pier, Chicago, Dec. 6-Dec. 11

FOREIGN SHOWS

Yugoslavia, Automobile Section, Commercial Fair, Belgrade, Sept. 11-21
France, 31st International Automobile Salon, Paris, Oct. 7-17
Great Britain, 31st International Automobile Exposition, London, Oct. 14-23
Czechoslovakian Automobile Show, Prague, Oct. 16-24
Italy, 10th International Automobile Salon, Milan, Oct. 28-Nov. 9
Great Britain, 13th International Commercial Automobile Exposition (trucks and buses), London, Nov. 4-13
Toronto, Ont., Automobile Show, Nov. 6-13
Great Britain, 36th Scottish International Automobile Exposition, Glasgow, Nov. 12-20
Montreal, Que., Automobile Show, Nov. 20-27

CONTESTS

National Outboard Championship Regattas, Richmond, Va., Sept. 18-19

CONVENTIONS AND MEETINGS

American Transit Association, 56th Annual Convention, White Sulphur Springs, W. Va., Sept. 19-23
S.A.E. Section Regional Transportation Meeting, Chicago, Sept. 29-Oct. 1
American Foundrymen's Association Midyear Meeting, Columbus, Ohio, Sept. 30-Oct. 1
S.A.E. Fuels and Lubricants Regional Meeting, Tulsa, Okla., Sept. 30-Oct. 1
National Lubricating Grease Institute, Annual, Chicago, Oct. 4-5
S.A.E. National Aircraft Production Meeting, Los Angeles, Calif., Oct. 7-9
American Foundrymen's Association, Regional Conference, Rollo, Mo., Oct. 8-9
National Battery Manufacturers Assn., Chicago, Oct. 10-12
National Safety Congress & Exposition, Kansas City, Oct. 11-15
National Metal Congress, Atlantic City, Oct. 18-22
National Machine Tool Builders Assn., Annual Meeting, Hot Springs, Va., Oct. 25-27
S.A.E. Annual Dinner, Commodore Hotel, New York, Oct. 28
American Petroleum Institute, 18th Annual Meeting, Stevens Hotel, Chicago, Nov. 8-12
S.A.E. National Production Meeting, Flint, Mich., Dec. 8-10
American Road Builders' Association, Cleveland, Jan. 17-21, 1938

STAINLESS STEELS—

By H. E. BLANK, JR.

DURING the relatively brief period of their commercial production, stainless steels have moved swiftly into a position of prominence among engineering materials. The automotive industry, today the largest single consumer of corrosion and heat-resistant steels, is credited by many authorities with having given the initial impetus to large-scale production of stainless steels. In the words of Curtis G. Snyder, sales engineer, Republic Steel Corp., "The era of stainless steel really began with the advent of its use . . . by Ford." He referred to Ford's adoption of stainless steel for radiator and lamp shells, hub caps, moldings and other bright parts in 1929 and 1930. According to the American Iron and Steel Institute, the output of stainless steel in the United States continues sharply upward. Production in gross tons for 1934 was 49,917; in 1935

it climbed to 65,697, and in 1936 it totaled 90,966.

The tonnage figures are especially interesting in view of the fact that the first large commercial quantity—50 tons of cutlery steel—was produced only 23 years ago, by Thomas Firth & Sons, Ltd., Sheffield, England. Stainless steel was discovered less than 30 years ago, almost simultaneously by Brearley in England and Strauss in Germany, two research metallurgists working independently. Both are credited with recognition of the two fundamental types of stainless steel, the

production in the United States has nearly doubled in two years with automobiles the biggest user.

straight chromium and the chromium-nickel classes.

Among the principal producers of stainless steel in the United States at the present time are: Allegheny Steel Co., American Rolling Mill Co., Bethlehem Steel Co., Carnegie-Illinois Steel Corp., Carpenter Steel Co., Ludlum Steel Co., Republic Steel Co., and the Rustless Iron and Steel Corp. Their output takes various commercial forms, such as sheets polished and unpolished, hot-and cold-rolled strip, bars, tubing, angles, and others. More than 60 different analyses of stainless steels are now being produced by these companies.

Since the commercial inception of stainless steels, numerous improvements in chemical and physical properties of the alloy have evolved from metallurgical refinements, modern developments in manufacturing processes and equipment, and improved methods of fabrication. Hints of further advances in the future suggest interesting possibilities for extended applications of various varieties of the metal.

Apparently, development work directed at producing colored stainless steel parts in all of the primary hues is meeting with success. While very little information is available regarding details of the process, tests conducted on colored stainless steel indicate enhanced corrosion resistance



Tapping a heat of stainless steel from a 30-ton Heroult electric furnace at South Works, Carnegie-Illinois Steel Corp., Chicago.

under certain conditions of exposure, and also excellent abrasion-resistant properties. Coloring is said to be accomplished most satisfactorily after parts of stainless steel are completely fabricated. Where superior tensile properties are desirable in stainless steel, it appears that boron has distinct possibilities as an alloying element.

Attempts have been made to adapt the open-hearth furnace to the production of stainless steels, and some definitely promising results have been obtained. It does not seem unreasonable that within a few years this method will open new fields for the material, as production costs would be lowered, owing to the more economical melting. At the present time, virtually all stainless steels are produced in the electric furnace. Some details on the open-hearth method are presented in the latter part of this article.

The most valuable characteristic of stainless steel, that of corrosion resistance, is derived from the alloying element chromium. No other known alloying element added in the same or smaller amounts will produce the results obtained by the addition of chromium. As explained by J. H. Critchett, Union Carbide & Carbon Research Laboratories, New York, "... corrosion resistance of chromium steels is evidently due to the formation of a thin, adherent, continuous film of chromium oxide."

The smallest chromium content that will assure the desired corrosion-resistant property is generally placed at about 10 per cent. Accordingly, the chromium contents of commercial

grades of stainless steel known as the straight chromium types, begin with 12 per cent and range upward to as high as 30 per cent. Carbon content usually ranges between 0.07 and 0.30 per cent. However, in some cases it is as high as 1.0 per cent for wrought alloys, and it peaks at 3.0 per cent for

alloys to be used in making castings.

The straight chromium alloys may be regarded as subdivided into two groups: those which have properties modifiable by heat treatment and others in which no appreciable change in either constituents or properties can be brought about by heat treatment.

Straight chromium steels may be improved as to physical properties or have their corrosion resistance further enhanced by the addition of other elements. For instance, if copper is added to chromium steel, it tends to improve its resistance to atmospheric conditions. This is undoubtedly due to the fact that copper is resistant to carbonic acid in mild concentrations.

A second group of stainless steels comprises chromium steels modified by additions of nickel. The most widely known chrome-nickel stainless alloy is that designated as 18-8, which contains 18 per cent chromium and 8 per cent

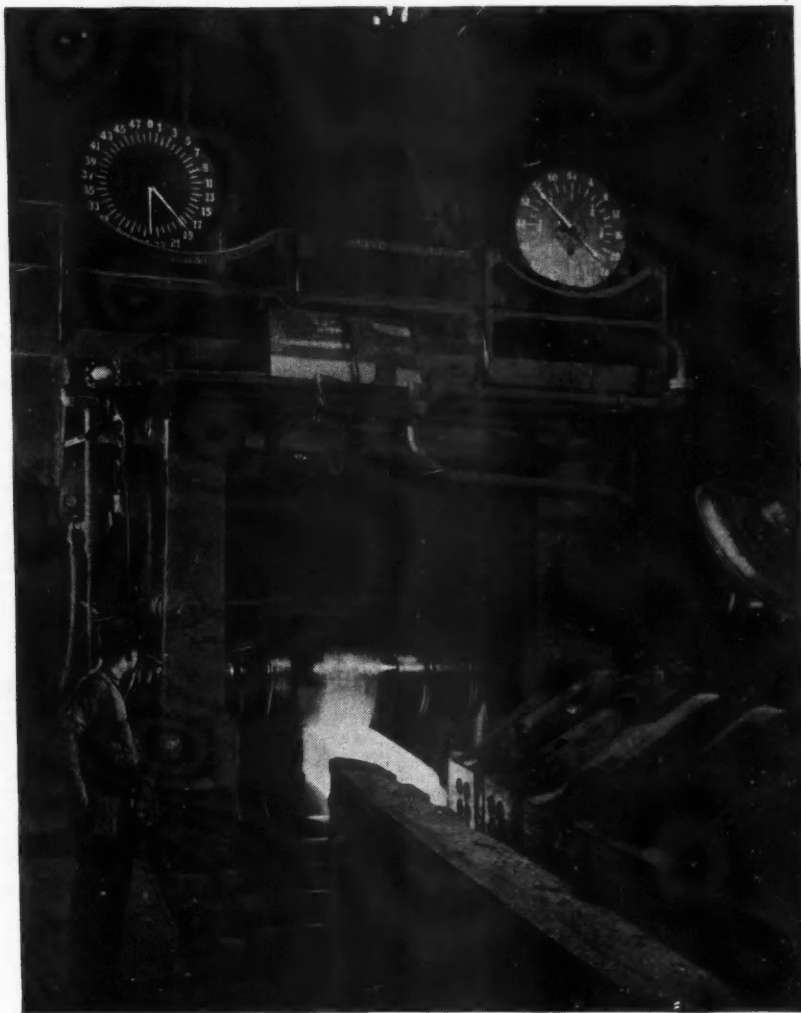


Photo courtesy U. S. Steel Corp.

A blooming mill in which ingots of stainless steel are rolled into blooms, billets or slabs for further processing. The operator in the foreground is checking temperature with an optical pyrometer.

Automotive Materials

nickel alloyed with the steel. Metallurgically, the effect of nickel is to produce an alloy of the stable, austenitic type, which is characterized by toughness and ductility, no capacity for hardening by heat treatment, high resistance to impact, and the property of being non-magnetic. Nickel also increases the corrosion resistance of stainless steel, improves its resistance to scaling at high temperatures, reduces grain growth, and lessens any tendency toward embrittlement after long service.

It may be stated generally that the addition of other alloying elements to chromium steel tends to improve the resistance of the steel to certain kinds of corrosion. If the steel is to be exposed to an oxidizing atmosphere, it should contain more chromium than nickel. Should the service atmosphere be highly reducing in character, then the nickel content should exceed that of chromium.

In this connection it is interesting to note that while the chemical resistance of straight chromium steels is a function of the amount of chromium in the steel, it is not a linear function thereof. In other words, an abrupt change in the corrosion-resistance properties is produced by small additions of chrom-



Four-high mill by means of which stainless steel is cold-rolled to produce a smooth surface finish or high tensile properties.



ium. For instance, steels containing 12 per cent of chromium and over are decidedly superior to steels having a chromium content of 11 per cent. The characteristics of chromium steel change sharply again at 22 per cent of chromium content, and again at 25 per cent.

A third broad classification of stainless steels is the chromium-manganese group, in which manganese serves approximately the same function as nickel in chrome-nickel stainless steels.

Modifications in any of the three basic classifications may be achieved by the addition of other elements, such as aluminum, columbium, copper,

"Inspecting for accuracy of gage." The employe is using a micrometer to check edge thickness of coils of hot-rolled stainless steel strip. These coils are further processed into cold-rolled strip or cut for rolling into sheets.

molybdenum, titanium, tungsten, silicon, selenium, vanadium and zirconium sulfide.

When molybdenum, tungsten and vanadium are added, they tend to improve the mechanical properties, especially increasing the strength at high temperatures. Silicon and aluminum find application as alloying elements where it is desired to improve the physical properties of metals intended for use in high-temperature service and where corrosive action of products of combustion will be encountered.

Titanium and columbium have the effect of reducing chromium carbides, so that the chromium content is increased. Columbium also influences the physical properties, particularly the ductility, which is important where deep drawings are to be produced; it proves beneficial also where the metal is intended for high-temperature applications or is to be fabricated by welding.

Free machining qualities are obtained by the addition of zirconium sulfide and selenium.

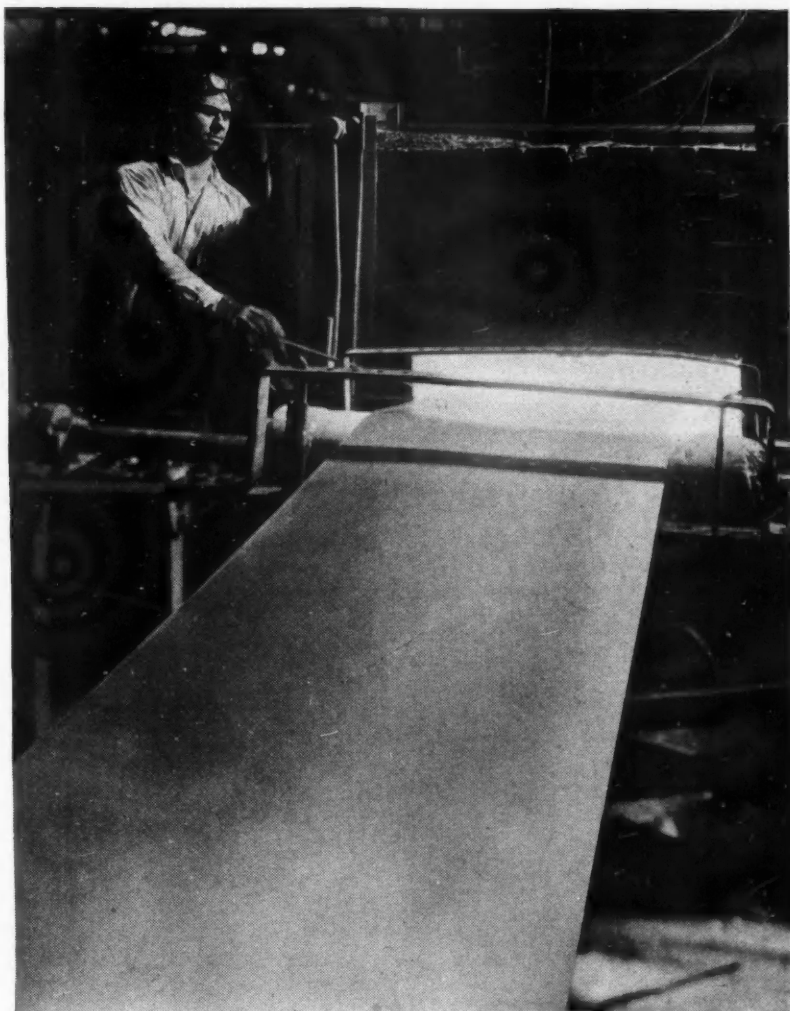
It seems worth pointing out that no one stainless steel will withstand all corrosive agents. The behavior of a stainless steel can be predicted only when all details of fabrication, assembly and maintenance are known. Further, the character of the corroding media and any changes therein during

the processes involved must also be known.

Before discussing the open-hearth process of producing stainless steel and the fabrication of stainless members by welding, let us examine briefly the process of manufacturing.

The electric furnace, in which the bulk of the stainless steel is melted,

consists of an outer shell, cylindrical in shape and lined with refractory brick. Through the dome-shaped roof are passed two carbon electrodes approximately 17-in. in diameter and about six feet long. In operation, an electric arc plays across a gap of approximately 1 in. between the electrode and the surface of slag, the current passing



Extra-width cold-rolled stainless steel strip emerging from a continuous annealing furnace.

Truck trailer of stainless steel. An example of weight-saving by use of light gage stainless steel with same strength as heavier gage ordinary steel.

Photo courtesy Republic Steel Corp.





Rolling stainless steel sheets. Operator at right is blowing compressed air on the sheet to remove any loose scale present. Sheets must be kept free of scale during rolling to prevent marking.

Stainless steel sheets which have been pickled and are being lowered into a water tank for washing and rinsing.

Aircraft exhaust collector ring gas welded of stainless steel.



through the slag to the metal, and the circuit is completed by the current passing through the slag and arcing across the air-gap to the other electrode. As the walls of the furnace are relatively cool, compared to the intense heat directly under the electrodes, the metal is set in motion, whereby heat is thoroughly disseminated throughout the charge. A temperature of about 3500 deg. Fahr. is produced in a short time, and the temperature can be accurately regulated and controlled.



Typical applications of stainless steel to automotive vehicles and aircraft

AUTOMOBILES

Butterfly valve parts
Carburetor needles
Cowl molding
Dashboard and trim
Door handles
Exhaust manifold studs
Gasoline gage parts
Gas tank caps
Hardware screws
Headlamps
Hood hinges
Hood louvres
Hub caps
Instrument parts
Poppet valves
Radiator grilles
Radiator shells
Running board molding

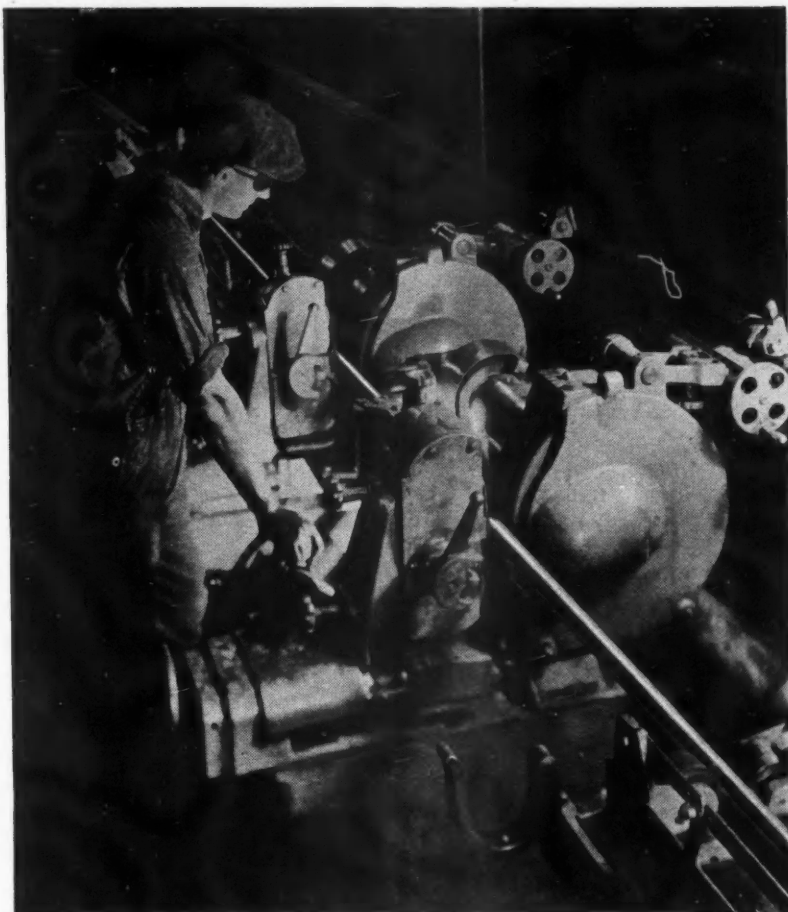
Steering wheel spokes
Thermostat parts
Tire cover molding
Water pump shafts
Wheels
Window trim

AIRCRAFT

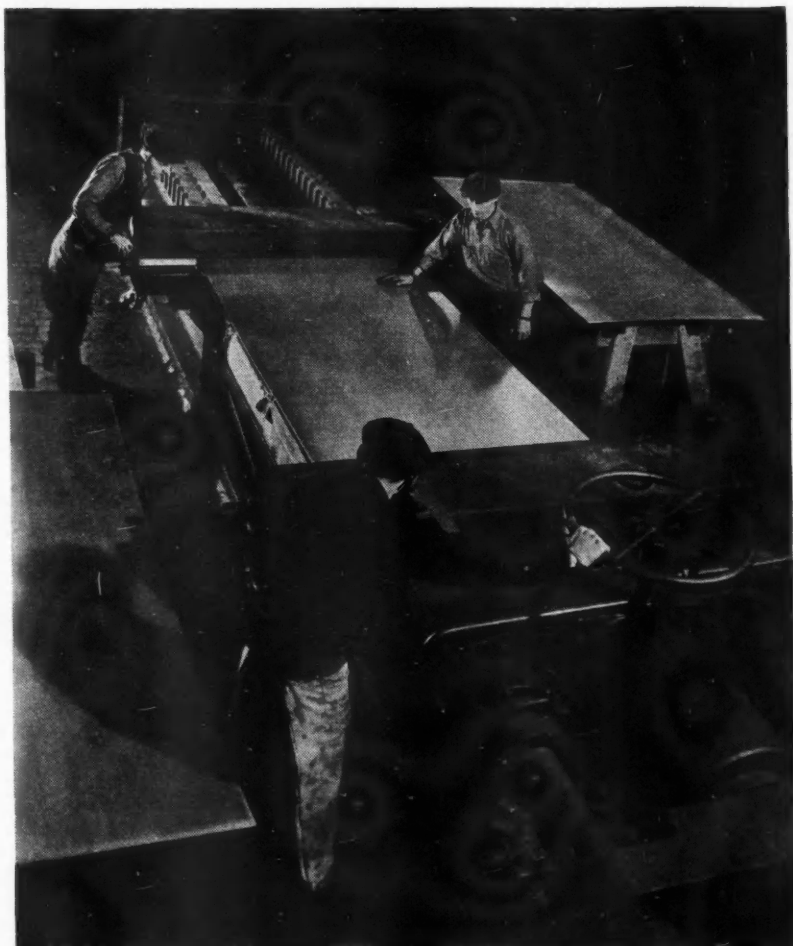
Amphibian hulls
Fire walls
Floats
Instrument parts and panels
Manifolds and collector rings
Pontoons
Sheathing
Struts
Tie rods
Wire cable

When a charge of stainless steel is ready to be poured, whether it has been melted in the electric furnace or by the open hearth process, it is tapped into a ladle. The ladle once filled with its molten charge, is transported by crane to the ingot molds, into which the hot liquid metal is run. After the ingot metal has solidified, the ingot is taken to a soaking pit, where it is subjected to controlled heat over a period of time sufficient to permit internal stresses in the ingot to be relieved. The stainless steel ingot is especially "tender", and the time and temperature of "soaking" therefore must be accurately controlled.

In subsequent operations the ingot is passed through a rolling mill, from which it emerges as a slab or a bloom. Slabs are thick, flat pieces of metal. Blooms are long and approximately square in transverse section. Plate, hot-rolled strips and sheet bars are rolled from the slabs. Blooms are rolled into billets, which may be square, rectangular or round in cross-section. Additional rolling operations performed on billets produce variously-shaped bars and tube rounds. The latter are used for piercing in drawing seamless tubing.



Polishing stainless steel bars in a centerless grinder.



Stainless steel plates are rolled in one modern plant in this country on a 96-in. continuous mill. The mill consists of a straight line arrangement of a slabbing mill, slab furnaces, three stands of roughing rolls and six stands of finishing rolls. In addition, there is a huge cooling table. This equipment will accommodate plates ranging in thickness from $\frac{1}{8}$ in. to $1\frac{1}{4}$ in.

Sheets comprise a large proportion of the stainless steel output. As much of the tonnage of stainless steel sheets must have highly polished surfaces, free of imperfections, meticulous care is essential in the production of this commercial form.

Hot rolling is the first operation in manufacturing sheets from slabs. The hot-rolled sheets are then subjected to

Hydraulic stretcher leveling machine. With this equipment the stainless steel sheet is stretched sufficiently to produce a smooth and even surface.

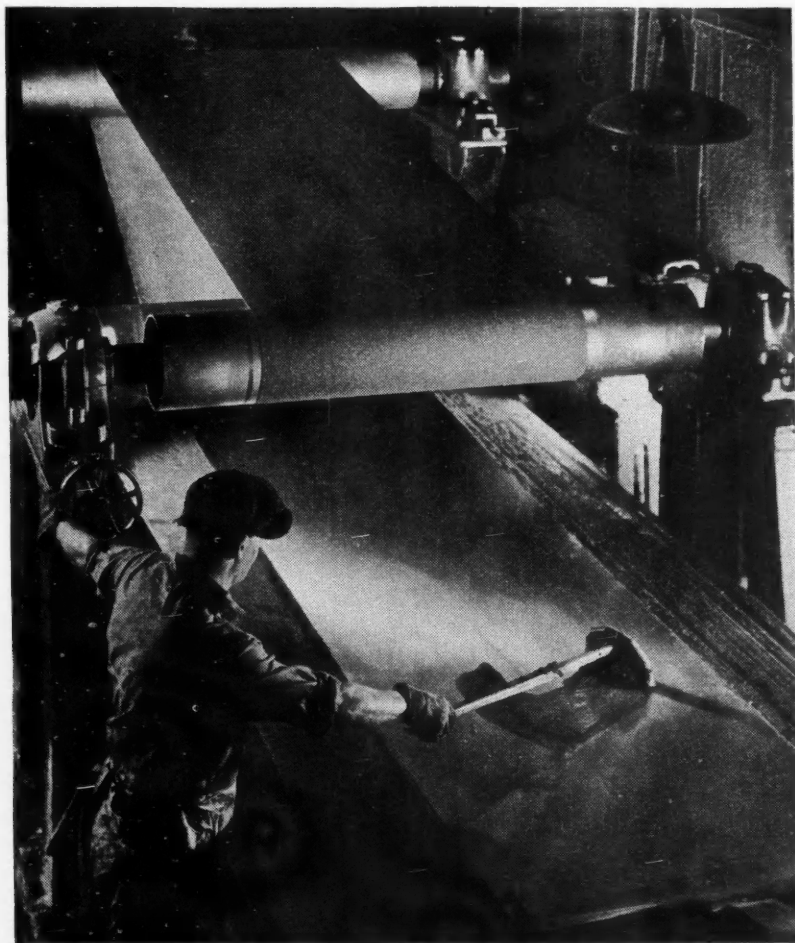
annealing or heat treatment, according to the metallurgical analysis of the material. Some compositions of stainless steel are not responsive to heat treatment.

Straight-chromium stainless steel sheets need only be annealed, whereas sheets of various chrome-nickel analyses must be given a high-temperature heat treatment. Continuous-type annealing furnaces have been found to give the best results, which are only obtained by close regulation of temperatures and periods of exposure. Deleterious effects from over-annealing include imperfect surfaces and a tendency of such sheets to "orange-peel," a surface defect which appears during subsequent bending or forming operations. After the stainless steel sheets are heat-treated or annealed, they are passed through a pickling bath, then thoroughly washed. Here again care is imperative. Over-exposure of the sheet to the pickling solution might result in excessive loss of metal and also so affect the surface that polishing would be extremely difficult.

Sheets are then polished or cold-rolled. If polished, they are first rough surface ground, then highly polished



Finish grinding stainless steel sheets. The operator is applying a suitable grease.



with powdered lime as abrasive. Any desired finish up to "mirror finish" can be produced, and most grades of finish commercially available are classified by identifying numbers.

Any warp or buckle there may be in the sheets is removed by "stretcher-levelling." As the name of the process indicates, these deformities are removed by stretching.

Stainless cold-rolled strip of the annealed classification is used for small stamped and pressed parts, and for automotive vehicle trim. Stainless strip which has been subjected to extra amounts of cold-rolling to give it greater tensile strength and make it harder, is utilized in the construction of railway cars, aircraft, truck trailers and many other products in which

Operator slushing grease on a stainless steel sheet in rough grinding operation.

Stainless steel sheets being packed and crated for shipment. Polished sheets are separated with special paper inserts to prevent marring and scratching.

light-weight, strong construction is desired.

Cold-rolled strip is produced from hot-rolled strip and is rolled down to the finished thickness. A number of anneals are given to the strip at different points in the process of reduction to gage. This is especially important with stainless strip of the 18-8 type and its variations. Annealing operations in the cold-rolling mills are also continuous, and include pickling and rinsing. The advantage of the continuous anneal over the previously favored method of heat treating strip while in coil form, is that with the present method all surfaces are reached.

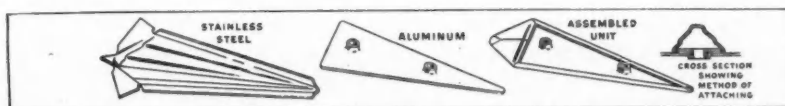
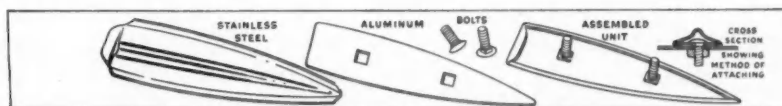
Strip of the 18-8 classification is sometimes subjected to additional hard rolling, to further increase its tensile strength up to between 150,000 and 180,000 lb. per sq. in. These rolling operations must likewise be interspersed with annealing treatments.

Various methods are used for imparting a high-lustre finish to stainless steel bars. One plant utilizes centerless grinding; another has adapted cold drawing to squares, hexagons, flats and rounds. It is reported that the centerless grinder produces the best surface finish. Very fine stainless steel wire is now being used, among other applications, for filter cloth. As reported in a recent issue of *U. S. Steel News*, published by the United

States Steel Corp., wire with a diameter of 0.0019 in. is being regularly produced. A 20-mile strand of this wire would weigh only one pound. This very fine wire is made by drawing through tungsten-carbide and diamond dies. Stainless steel wire is annealed in a

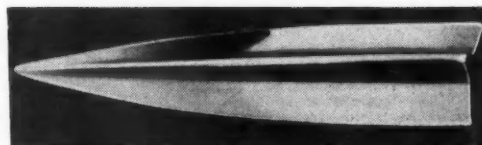
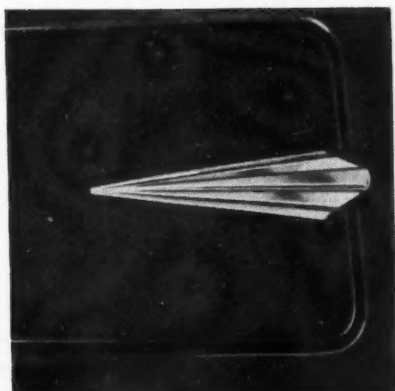
hydrogen atmosphere, which prevents the formation of scale.

Many factors contribute to the high cost of stainless steel, but the most important ones have to do with the melting or finishing process in its manufacture. At present prices, the cost of



(Upper right hand group) The line drawing shows construction details of stainless steel hood door molding illustrated in the photograph. The part consists simply of a simple stamping of light gage stainless steel plus a simple stamping of aluminum punched into hollow rivets.

(Adjacent group) Construction details of cowl vent molding of stainless steel, the finished part being shown in the accompanying photograph.



the basic constituents, that is the raw ingredients, in a pound of 18-8 stainless steel amounts to approximately five cents. Other charges incurred in its manufacture boost the price of the commercial product to more than 20 cents per lb. Some varieties range up as high as 55 cents per lb.

Among the factors which appreciably

Drawings and photos courtesy of Carpenter Steel Co.

affect the cost of production of stainless steels are the large amount of scrap lost, the great number of anneals and pickles essential to proper production practice, as compared with ordinary steel, and the labor that must be expended in carefully polishing stainless steels to the desired finish.

Much thought has been given to the problem of lowering the cost of production of stainless steel, and it appears that two schools of thought have evolved, with differing ideas as to how this can be best accomplished. One group holds that economies can most readily be effected in the finishing processes; the other claims that the melting process offers the greater opportunity for drastic cost reduction.

As previously mentioned, in this country virtually all of the stainless steel is produced in the electric furnace. When the capacity of the open hearth process (225 tons per 24 hr.) is compared with that of the electric furnace (40-50 tons per 24 hr.) it becomes apparent that it would be a major step in the direction of reduced unit costs

if stainless steel could be produced successfully in the open hearth. It seems that considerable experimental work along this line has been done in Germany, but the activities are clothed in secrecy and no definite information

can be obtained. Two important contributions to the solution of the problem of open-hearth production of stainless steel are the Simpson and Bosshardt open hearth furnaces.

(Turn to page 400, please)

Exhaust manifold and collector rings on this United Air Lines transport are made of stainless steel.



Automotive *Materials*

NEW DEVELOPMENTS

Expect No Increase In Price of Carboloy Cemented Carbides

Because of the present world situation and the noticeable effect it has had on the supply and price of tungsten, a recent announcement by W. G. Robbins, president of Carboloy Co., Inc., Detroit, is of interest.

Mr. Robbins said, in part, "... tungsten carbide is the main ingredient of Carboloy. Tungsten concentrates from China were used for the manufacture of tungsten carbide for Carboloy for several years, not only because of availability but also because of the high purity of such concentrates.

"Because of the uncertainty in connection with the continuation of an adequate supply of tungsten of the proper purity from China, the General Electric Co., during the past few years, has purchased two tungsten mines in the United States. The material from both of these mines is of the high

purity demanded for Carboloy requirements.

"At the moment, shipments of Chinese concentrates have been suspended and the price of tungsten has risen rapidly. However, the General Electric Co. assures the Carboloy Co.—its subsidiary—than an adequate supply of tungsten will be available from the operation of the domestic mines, to satisfy all Carboloy needs.

"Notwithstanding the increase in the market price of tungsten, we have every reason to believe that the price of cemented carbide manufactured by the Carboloy Co. will not be increased as a result of this condition."

Ryerson Announces "Certified Plan" as Aid to Steel Users

Of interest to steel users is the "Certified Steel Plan" recently announced by Joseph T. Ryerson & Son, Inc., Chicago. Under this plan, Ryerson selects entire heats of alloy steels

that come within certain narrow analysis limits, tests the steel for chemical and heat-treatment characteristics, and prepares complete data for the customer, whether the order is for a few bars or several tons.

In working out this system, Ryerson had two fundamental problems to overcome. The first was to secure standard alloy steels for stock which conformed to an analysis range closer than that specified in the SAE ranges, and which were closely controlled in general hardening characteristics. The second problem, after having secured such steel, was to develop a method of informing each customer of the complete analysis and heat treatment characteristics of each bar shipped to him.

The first problem was solved by writing specifications for all Ryerson steels on a much closer chemical analysis basis than the standard SAE specifications and including in these specifications other factors governing the heat treatment responsiveness of each type of steel. Arrangements were made

to watch heats and select only those that came within this restricted range. The heat is then identified by letter symbols and later rolled into bars, bearing the same letters.

Identification letters are stamped on the ends of each bar. In the case of small bars, the bundles are tagged. Heat treating tests are made on standard samples from each heat.

All bars produced from a heat carry the identifying letters assigned to that heat.

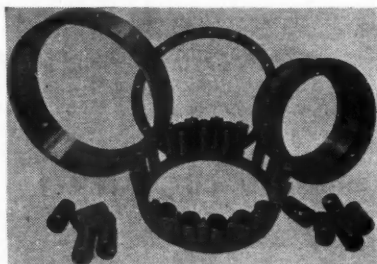
In order to condense the information regarding these special heats, Ryerson devised two types of charts, one for carburizing steels (case hardening) and the other for steels of higher hardening characteristics which are heat treated by quenching. These charts in the case of the carburizing steels give the heat analysis identifying letters, McQuaid Ehn grain size, cleanliness rating, and also the results of a carburizing test of a standard sample. This shows the hardness of the case, the effective depth of the case and the physical characteristics of the core.

In the case of the quenching steel, the analysis, identifying letters, McQuaid Ehn grain size and cleanliness rating are shown, together with a chart showing curves representing tensile strength, yield point, elongation, reduction of area, Brinell hardness, etc., as developed by test specimens quenched at a suitable temperature for the analysis and drawn to various temperatures.

This information is delivered immediately to the customer so that it is received before the steel is subjected to heat treatment.

Aluminum Permanent Molded Cage for Tapered Roller Bearings

An interesting application of aluminum is the patented silicon aluminum alloy cage for tapered roller bearings manufactured by the Orange Roller Bearing Co., Inc., Orange, N. J. The cage is molded by the permanent mold process with roll pockets molded to the exact taper and contour of each roller



Silicon-aluminum alloy bearing cage

Automotive Industries

to assure positive alignment and permanent retention.

The silicon aluminum alloy used for this purpose is highly non-abrasive and, as stated by the bearing manufacturer, it does not cause any wear on the rollers.

Steel components of the bearings are manufactured from high carbon chrome electric furnace alloy steel SAE 52100, hardened throughout and ground to exacting manufacturing criteria.

Test Papers Show pH of Plating Solutions

A method of determining the pH of plating solutions at the tank in about five seconds time has been announced by the Udylyte Co., Detroit. The pH indicator papers used for this purpose are graded for pH range and consist of strips of special paper impregnated with a highly sensitized indicator and a scale of color bars. Each bar is of a different color and has a definite pH value. When an indicator strip is placed into a solution to be tested the indicator will change color. The pH value of the solution is obtained by comparing the color of the indicator with the colors of the color bars on the same strip.

The pH papers are also adaptable for determining the pH of alkaline cleaners.

Decorative Effects by Pigmenting Plastics With Aluminum Powders

Decorative effects in molded plastics are now being obtained through the use of certain grades of aluminum lining powders according to Junius D. Edwards' book entitled *Aluminum Paint & Powder* recently reported in the *Aluminum News-Letter*. The powder flakes introduced into these plastics (Pyralin is an example) assume different orientations in different areas and reflect light beams in many directions. The resulting appearance is described as "silky," somewhat similar to the moire effect obtained by water processing silk. Further enhancement of the effect may be gained by dyeing the plastic or using dyed aluminum bronze powders, or both.

It is also possible to achieve novel decorative effects with films or sheets made from cellulose derivatives by the addition of coarse flakes of aluminum powder. By more heavily pigmenting with a finer grade of powder, a material resembling aluminum foil is produced.

Translucent Beetle Used in Lighting Unit for Buses

A new interior lighting unit for buses and railroad cars was recently introduced by the Miller Co., Meriden, Conn. The outer frame and reflector are



Miller lighting unit

made of aluminum; the light diffusing medium is molded translucent Beetle; and the light transmitter and director is a small panel of transparent glass. Weight of the entire unit is only 12.7 oz.

Black Enamel With High Electrical Resistance

A black enamel with special dielectric properties has been developed by Maas & Waldstein Co., Newark, N. J.

The material is said to be especially suitable for finishing electrical apparatus such as steel switchboards and instrument panels, coils, and radio bases. It dries to a rubber finish, and is tough, durable, and has high electrical resistance, according to the manufacturer. It is applied by spraying.

A surfacer with similar dielectric properties is also supplied for preparing the surface to be finished with the enamel.

Bonding Process Provides Rust-Proofing Base on Iron and Steel Surfaces

Protection of iron and steel surfaces against corrosion and a suitable base for paint, enamel, lacquer, japan, and varnish, are said to be provided by a bonding process—trade-named "Marks Bond"—which is offered by the Bonding Process Corp., Detroit.

Metal is processed either by the dip or spray system methods and the equipment consists simply of a cleaning tank, and two or three rinsing tanks. Exposure time of only 15 to 30 sec. at temperatures ranging between 160 and 180 deg. Fahr. is required. Parts to be bonded are usually cleaned chemically.

The "Marks Bond" chemical is a concentrated compound which, when dis-

September 18, 1937

solved in water of a certain temperature, forms a solution that reacts immediately on properly cleaned metals. The coating is soft, opaque, and gray in color. Among other features claimed for the process is the virtual disappearance of sludge in dip tanks.

High Tensile Strength Solder And All-Metal Flux

Soldering of aluminum, cast iron, stainless steel, copper, brass and other metals can be accomplished by a high tensile strength solder and all-metal flux which have just been brought out by the Imperial Brass Mfg. Co., Chicago. According to the manufacturer, this solder is applied at low temperatures only slightly above those used for ordinary soft solders and will form a bond with tensile strength of over 10,000 lb. per sq. in.

Highly Inert Plastic for Automobile Water- Pump Impellers

Automobile water-pump impellers that resist anti-freeze and cleaning compounds are listed among many new applications for General Plastics' molding material known as Durez 77 SB.

Primarily characterized by its inertness, this molding material also resists frictional wear and permits machining operations without impairment of its water and chemical resistance.

As stated by the manufacturer, its use on pump impellers indicates that it wears better than metal. Other advantages include lighter weight and non-resonance characteristics which helps to reduce noise.

Ludlum Prepares Book on Working of Silcrome Stainless Steel

A new technical publication entitled "The Working of Silcrome Stainless Steel" has been issued by Ludlum Steel Co., Watervliet, N. Y. It gives details on methods of fabricating stainless steel and also supplies information on the grades of tool steel best suited to each operation.

The book contains practical advice on all the usual metal working operations, such as sawing, drilling, milling, threading, tapping; also on hot upsetting and forging, shearing, drawing, punching, spinning, brazing, soldering and welding. Additional information includes data on proper selection, heat treatment, etc., of the tool steels for various operations.

Converted to Burn City Gas

THE city of Vienna during the past year has converted 25 of its 80 garbage trucks to burn city gas instead of gasoline. A compressor installation has been made in the municipal garage. The gas is first compressed in five stages to 400 atmospheres, with intercooling by water at each stage. It passes from the compressors through a condenser to a battery of tanks, composed of 30 steel tanks of 26.5 gals. liquid measure each. At the distributing tank the pressure of the gas is reduced from 400 to 220 atmospheres by means of a reduction valve. Each truck carries six steel bottles which are not interchangeable. Each of the bottles has a capacity of 14.5 gals. liquid measure. These six bottles will hold about 2500 cu. ft. of gas in the uncompressed state. The trucks have a radius of action of 62 miles on one charge, which latter is said to be equivalent to 13.2 gals. of gasoline. In actual service the trucks cover from 22 to 56 miles per day, hence a single charge suffices for a day's work. The gasoline installation remains on the trucks and a change-over from gas to gasoline can be made by simply opening the gasoline cock and closing the gas valve. The economy of operation on city gas is affected to a considerable extent by the initial cost of conversion.—*Chimie et Industrie.*

Power Operated Steering Device

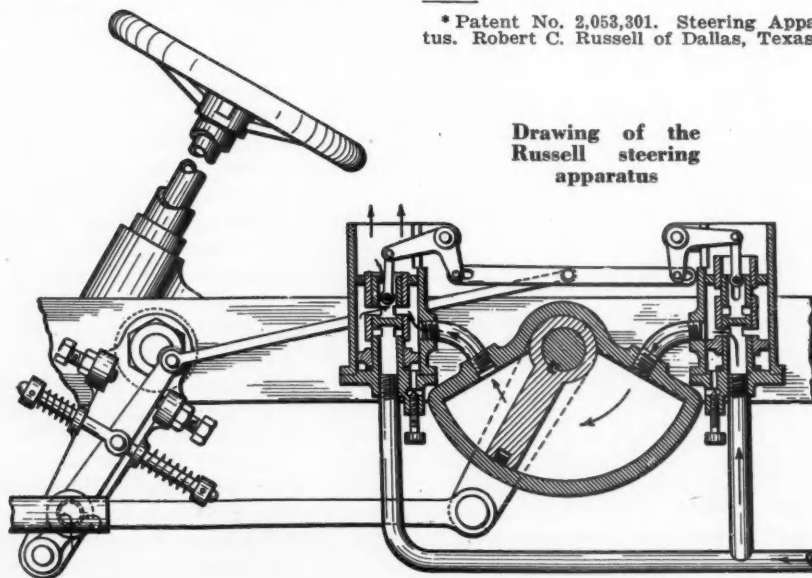
IN the operation of heavy road vehicles capable of considerable speed, it has been found advantageous to resort to power operation of the steering gear. The device is essentially a relay which is controlled by the pull of the operator on the steering wheel and which derives its power from some source supplied from the vehicle engine. A patent on such a steering apparatus recently assigned to the Bendix-Westinghouse Automotive Air Brake Co.,* provides means which enable the driver to feel at all times how much steering effort is being exerted, and also means which will return the front wheels of the vehicle to the normal straight-ahead position if the driver releases his grip on the steering wheel.

The apparatus includes the usual steering handwheel by means of which a rock shaft can be operated. A steering arm or pitman is fixed at its upper end to this rock shaft. A secondary steering arm is pivoted to the lower end of the primary arm and has its free upper end connected to a pair of valves for the hydraulic relay. A pair

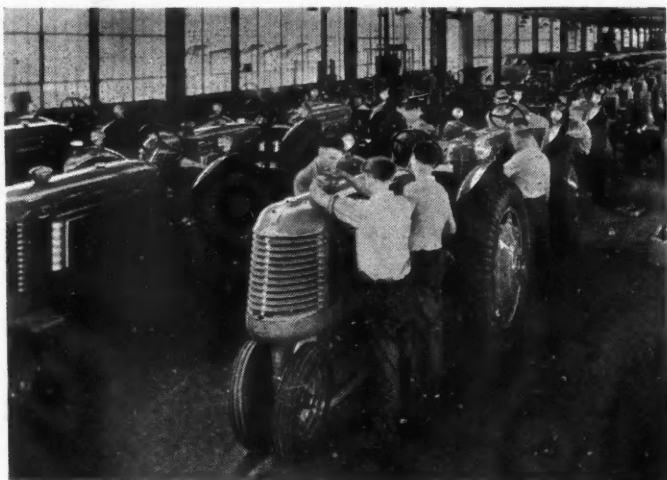
of coiled springs acting on the secondary steering arm urges the arm into the central or cut-off position. Stops are provided which limit the relative motion of the secondary to the primary steering arm. When the driver pulls on the steering wheel to deflect the vehicle from its course, the reaction of the ground on the front wheels causes the secondary steering arm to be moved

from its central position against the force of the "righting" springs, and the two valves of the relay to be moved, one into a position where it admits fluid pressure to the pressure chamber controlled by it, the other so as to open the pressure chamber controlled by it to the atmosphere. Fluid pressure then assists the driver in swinging the front wheels around.

* Patent No. 2,053,301. Steering Apparatus. Robert C. Russell of Dallas, Texas.



Drawing of the
Russell steering
apparatus



A view of the end of the Graham-Bradley tractor production line

Production Lines

The liquid is stored in a separate chamber. Now you can free the glass of bug debris or the fine mud that accumulates after a rain.

Equipment Programs

Once again we approach a new car announcement season with a realization that the automotive industry is currently investing many millions of dollars in productive equipment of every kind. Several of the independent producers are spending from two to five millions of dollars. And one of the larger companies is in the midst of a ten million dollar program. It is quite evident that there is no end to modernization since the process is as essential to the growth and development of a manufacturing organization as food is to the individual. Better ways of doing the job are being constantly explored and developed—and competition must be served.

Designed Rubber

One of the molded rubber parts used in a bus chassis serves as a brake rod bearing, of which a half dozen or so are mounted on the frame. The rubber composition is impregnated with paraffine which bleeds out and supplies lubrication automatically. It is also interesting to note that molded rubber-to-metal motor mounts are finding wide use on the new Diesel engine chassis that have been announced recently. A well-designed mounting takes all of the roughness out of the installation.

Makes Grade

After a big production season, the hypoid rear end emerges triumphantly as having made the grade. This coming season, the hypoid gear will make almost a clean sweep of the industry, invading even the largest chassis, and leaving no more than a couple of important producers with spiral bevels. Service history, taken in the main, has been so splendid that those who tried it on smaller models are extending it through the entire line.—J. G.

Die Castings

Chalk up a big year for die castings this coming season. Notwithstanding all previous discussion pro and con, die-cast grilles not only continue but have gained several new adherents for '38. Although it's trite to say so, they will be bigger and better. Some doggy new hardware will be in evidence; also the appearance of many large radiator ornaments which serve the utilitarian purposes of hood lift on cars with alligator fronts. Then, too you will find a number of die-cast combination license plate lamps and rear deck handles and locks.

Safety Features

Safety items again lead next year. Most cars follow the pattern set last season by Chrysler cars, in certain details. Popular will be soft seat back rolls on front seats, also recessed control knobs on the instrument panel. Said knobs in the main, are of molded plastics and are set in a recess rather than the flush type used by Chrysler.

Styling Changes

Fresh and distinctive styling is the order of the day on the new cars. This year you may expect to find distinctiveness to a greater degree than ever before. Several cars will be of rather advanced styling, although not radical in the way most of us look at a radical design.

Molded Plastics

'38 cars will go for molded plastics a rather big way. Instrument panel sections, ornament inserts, control

knobs, and a variety of other elements will be made of molded plastics. One of the most unusual is a huge instrument molded panel housing which, at the moment, is unsurpassed for beauty and intricacy of detail.

Materials Note

On good authority we have it that pearlitic malleable iron will play an important role in the near future. One of the prominent cars intends to use this material for rocker arms, replacing the customary forgings. The engineers were agreeably surprised at the unusually high physical properties of this material for stressed parts. In addition, pearlitic malleable iron appears to have valuable properties as a bearing material, and in fact, the rocker arm will use the reamed hole as a bearing for the shaft.

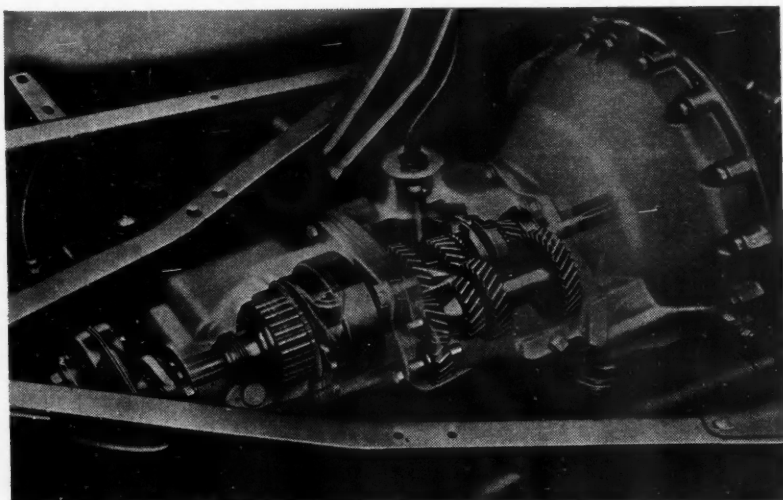
Bright Finish

It's a fact worth noting that bright finish is back stronger than ever, thus emphasizing the cyclical swings hither and yon with respect to eye-appeal features. More die-cast grilles, larger hardware and ornaments, stainless steel strips, bright moldings, and a host of other details herald a heavy swing to plated and stainless finish on the new cars.

Novel Fitting

One of the real novelties for the coming season will be a windshield wiper which combines with the usual cleaning action, facilities for washing the glass. It's a vacuum type device but it has an attachment for spraying bug juice or window cleaning fluid when desired.

STUDEBAKERS for 1938 . . .



In the new Studebakers the two shafts of the transmission are located in the same horizontal plane, which has made it possible to almost eliminate the tunnel in the front compartment.

MECHANICAL units of the Studebaker line remain substantially the same for 1938, but a number of interesting refinements and some major changes have been made. The President model has been lightened considerably and weighs approximately 200 lb. less than last year. The chassis frame was redesigned and while 18 per cent lighter than last year, has 70 per cent greater torsional stiffness. The Six also has a new frame, which while 8 lb. lighter than last year's, has more than 300 per cent its torsional rigidity.

"Planar" independent front suspension, which will be a Studebaker feature for the fourth season, has been materially improved and is now standard equipment on the entire line. The Hill-holder, which was formerly optional, is now standard on the President and Commander. An overdrive of the same type as used on last year's Dictator, is optional on the President and Commander. This overdrive comes in automatically at around 45 m.p.h. and cuts out automatically at about 35

m.p.h., and in addition it can be locked out manually.

A change has been made in the shock-absorber equipment, the whole line now being fitted with Houde two-way hydraulics with thermostatic compensation for the rear set. The steering hook-up has been improved.

While the transmission is similar to that used last year, it has a new housing and is mounted with the two shafts in the same horizontal plane. This has reduced the vertical height above the crankshaft axis and has almost eliminated the front-compartment tunnel.

Last year's hypoid rear axle is continued, with a standard reduction ratio of 4.55 and an optional ratio of 4.82.

A long semi-centrifugal clutch is standard on the President. The President engine has been moved forward 3½ in., to provide more room in the body. Both engines continue the Fram oil filter, which eliminates crankcase oil changes except to meet seasonal con-



View of the new steering control on the 1938 Studebakers showing the symmetry of the tie-rod layout.

ditions. However, the new filter is larger and easier to service. On the President, the water pump has been moved from its side mounting up to the front end, where it is driven by the fan belt.

A Stromberg carburetor with concentric bowl is used on the President engine. The automatic choke is built into the carburetor, its thermostat being actuated by the stream of hot air drawn by the carburetor from around the exhaust manifold.

Another new feature on the 1938 Studebakers is a special windshield

HAS reduced weight; bore in "Six" increased to make 217 cu. in. displacement; "Planar" suspension and Houde shock absorbers standard equipment; vacuum shifting device optional. . . .

wiper mechanism. The blades are vacuum-operated and are provided with piping which makes it possible to supply them with a liquid for washing the windshield so as to free it from "bug juice" or mud and of ice or sleet in winter.

A telescoping radio antenna will be furnished as part of the radio equipment. It is side-mounted on the cowl panel and is said to give fairly good reception in the city with the pole fully telescoped and completely out of sight.

The President engine retains the same dimensions as last year. It is an eight-cylinder of 3 1/16-in. bore by 4 1/4-in. stroke (250-cu. in. displacement). Because of the reduced weight of the car it has been found advisable to reduce the compression ratio from 6.5 to 6.0 and the power rating to 110 hp. at 3600 r.p.m. (from 115 hp.).

The six-cylinder engine is essentially the same as before, but the bore has been increased 1/16 in. It is now a six-cylinder L-head of 3 5/16-in. bore by 4 3/8-in. stroke, which makes the displacement 226 cu. in., as compared with 217 cu. in. last year. Although the performance has been generally improved, the engine rating remains the

same as last year—90 hp. at 3400 r.p.m., with a compression ratio of 6. Both engines have cast-iron heads.

Tin-plated, cam-ground Lynite pistons are used in both engines. The ring arrangement is the same as before, there being a total of three rings, all above the piston pin, two 1/8-in. compression rings and one 3/16-in. oil ring.

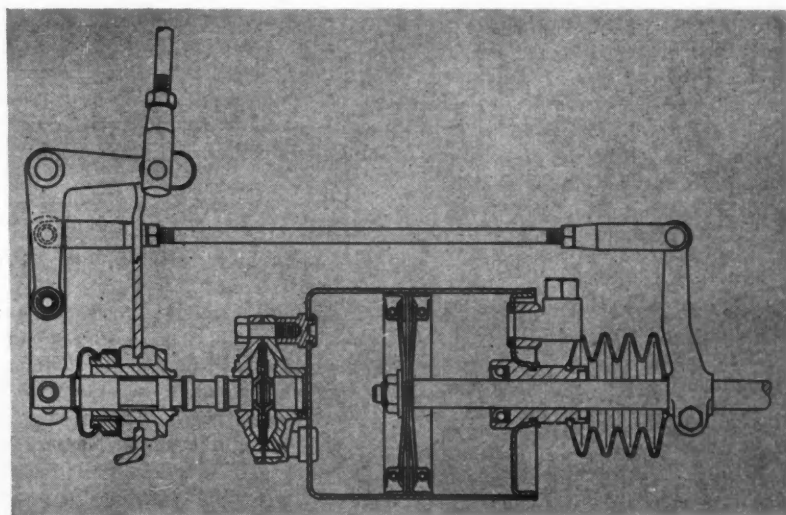
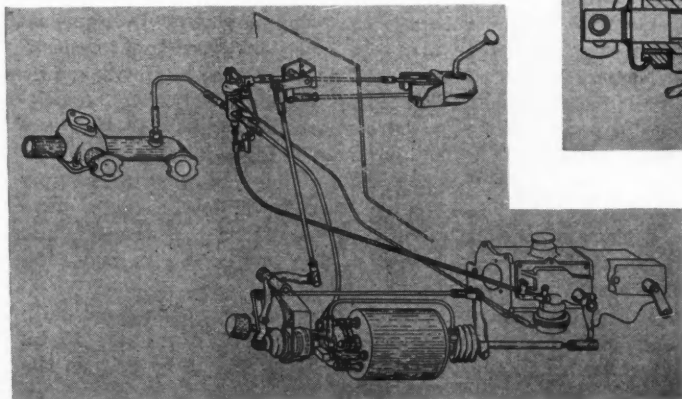
There are spun-in babbitt bearings in the big ends of the connecting rods on the Six. All models have steel-backed, babbitt-lined interchangeable precision main bearings.

Spark plugs are 18-mm. Champions with a gap setting of 0.0225 to 0.0275 in. Spark control is full automatic,

with vacuum advance. Six-cylinder cars have an Autolite generator with third-brush and vibrator voltage control. The President has a Delco-Remy generator with full automatic current and voltage regulation, the output being constant at 26 amp. All models have 15-plate, 105-amp.hr. Willard batteries.

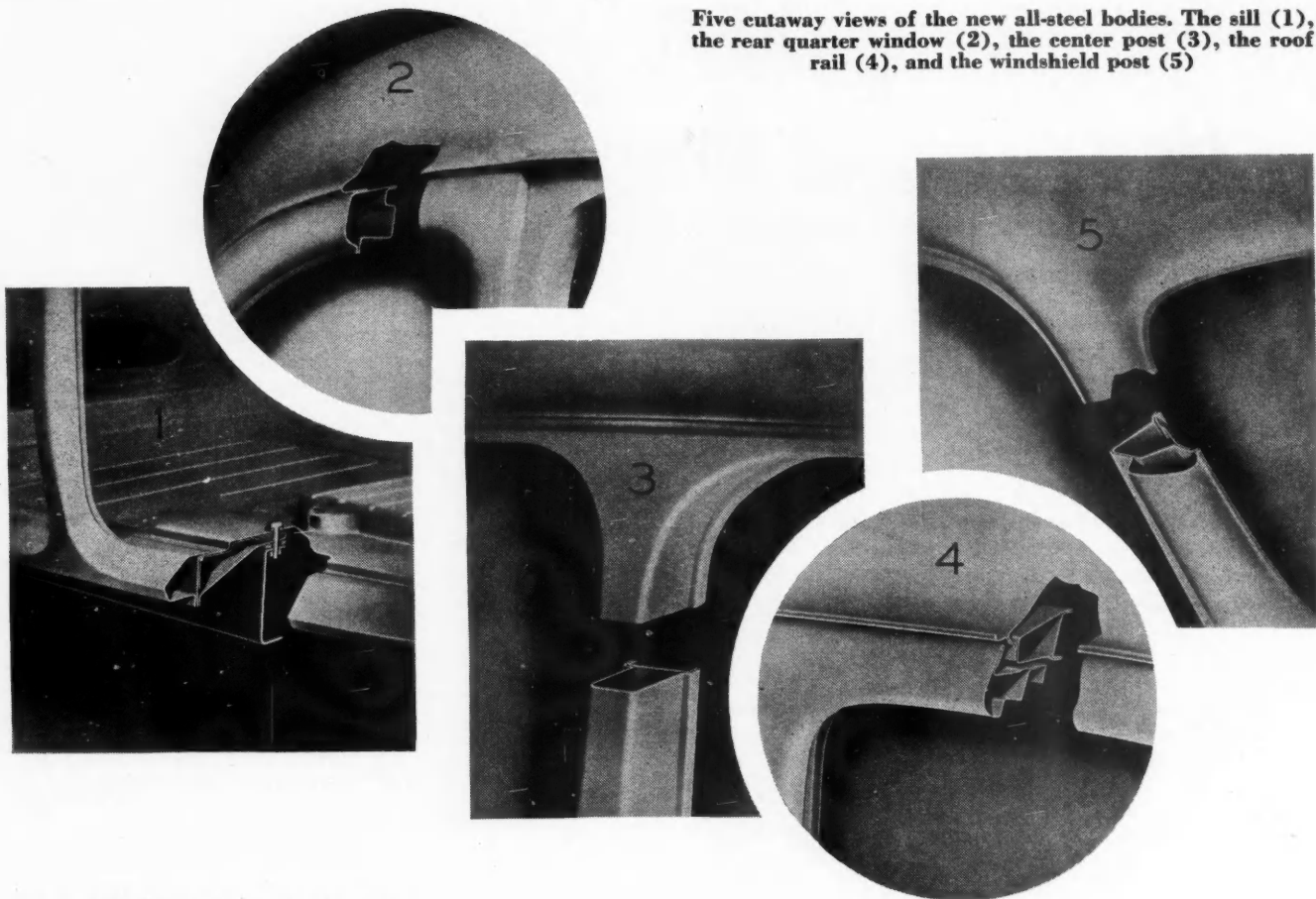
The President is fitted with Spicer needle-bearing universal joints. Composite brake drums are continued. On the Six the drum size is 11 by 2 in., an increase of 1/4 in. in width; on the President, the drum size is 11 by 2 1/4 in. (12 1/2 by 1 3/4 in. last year). Woven linings are used on front brakes, molded on the rear. The effective braking area is 150 sq.in. on the Sixes, 169 sq.in. on the President.

In the Planar front suspension the center section of the spring is now constrained, instead of being freely pivoted. The Houde shock absorber replaces the direct-acting type formerly

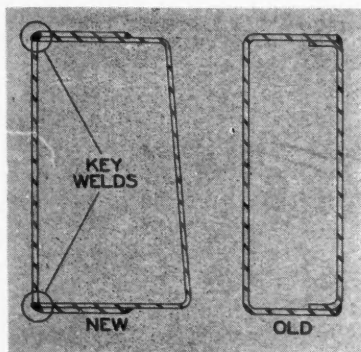


Above is a section of the vacuum transmission control and at the left a schematic view. The short shift lever is at the top right of the schematic view. The exhaust manifold, from which vacuum power is derived, is at the upper left. The vacuum booster is at the center bottom and the transmission is at the bottom right

Five cutaway views of the new all-steel bodies. The sill (1), the rear quarter window (2), the center post (3), the roof rail (4), and the windshield post (5)



used. With the adoption of independent springing as standard, Studebaker has further improved the steering geometry. As will be noted in the illustration, the new arrangement employs a transfer link on the right hand side, so that the linkage is symmetrical, comprising two tie-rods of the same length. In addition, the center of the tie-rod pivot on each side is aligned with the effective axis of rotation of the spring, so as to produce better steering geometry under all conditions and with flexing spring. A Ross cam-and-twin-lever steering gear is standard on all models, with a steering ratio of 21 to 1.



Cross section of the new frame and the old. Note greater width and additional "key welding"

The torsional rigidity of the chassis frame has been increased by changes in the design of the X-member. The two rails of this member are now straight and continuous, and they telescope at the center. At the front end, the X-member rails form a deep box-section extending into the front cross-member. The sections of the X-member are "key welded."

As shown in the drawing reproduced here, the optional vacuum-shifting device is in reality a combination of a positive mechanical shift with a vacuum cylinder which provides power for shifting. The hand lever operates the mechanical linkage for shifting as well as the bowden wire control for the cross-over shift. The linkage operates the vacuum cylinder control valve so as to get a follow-through movement of the cylinder, aiding in power shifting. A feature of the device is that the operator gets the same "feel" through the gear shift ball as with the conventional wobble stick, and in an emergency—due to extremely cold weather when the resistance may become abnormal or when the vacuum decreases—it is possible to shift manually by applying extra pressure to the control lever.

The center of gravity of the car is approximately 26 in. from the ground.

Bodies are bolted to the top of the frame with box section gussets that tie the floor pan and side panels together at each mounting point. The box-section structure has been retained throughout. The steel floor is in two main sections and is extended all the way up to the cowl. The front section of this floor extends from the toe board to the forward edge of the rear seat, the second section runs through the luggage compartment to the rear of the car.

Rotary door latches are continued. Defrosters have been made more efficient. Ash compartments in rear-seat arm rests of sedans have "roll top desk" covers of stainless steel. Doors are insulated all around. Tool chests are located beneath the floors of the luggage compartment. Door handles are fastened from the inside without exterior screws. License-plate brackets have been removed from the fenders and placed at the center of luggage-compartment lids.

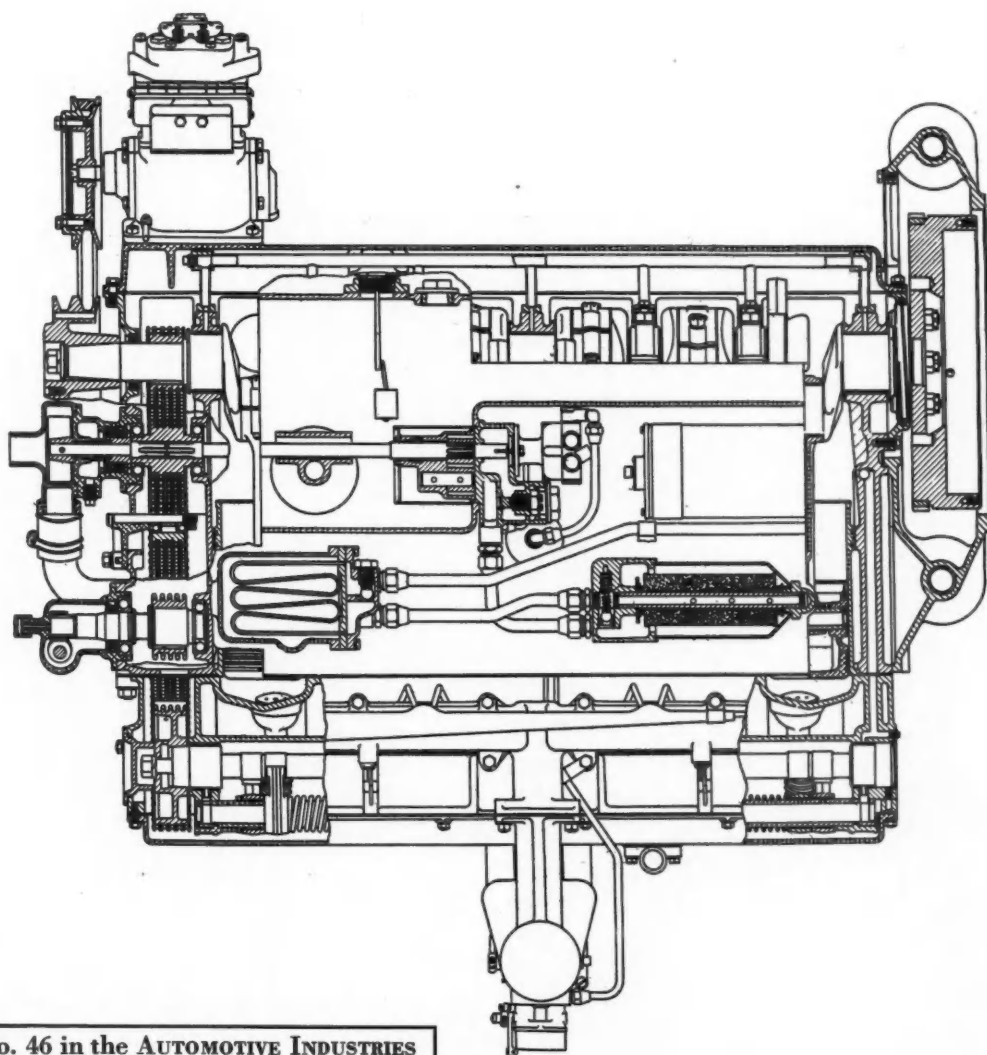
Drop-center rims are integral with the wheel stamping. Tires are 16 by 6.00 on the Sixes and 16 by 6.50 on the President.

Hall-Scott Horizontal

180 Hp. Engine

This engine, specially designed for use on motor coaches, has six cylinders with a bore of 5 in. and a stroke of 6 in., making its piston displacement 707 cu. in. It is rated 180 hp. at 2200 r.p.m. When fitted to a motor coach the engine is suspended under the floor amidships. A Zenith 2-in. carburetor is fitted, and igni-

tion is by a coil and distributor unit supplied with current from a 12-volt battery. Lubrication is by the pressure system, the oil capacity being 7 gals. The air compressor also is lubricated from the engine lubricating system. The lubricating system comprises a gear-type oil pump, an oil filter, and a temperature regulator.



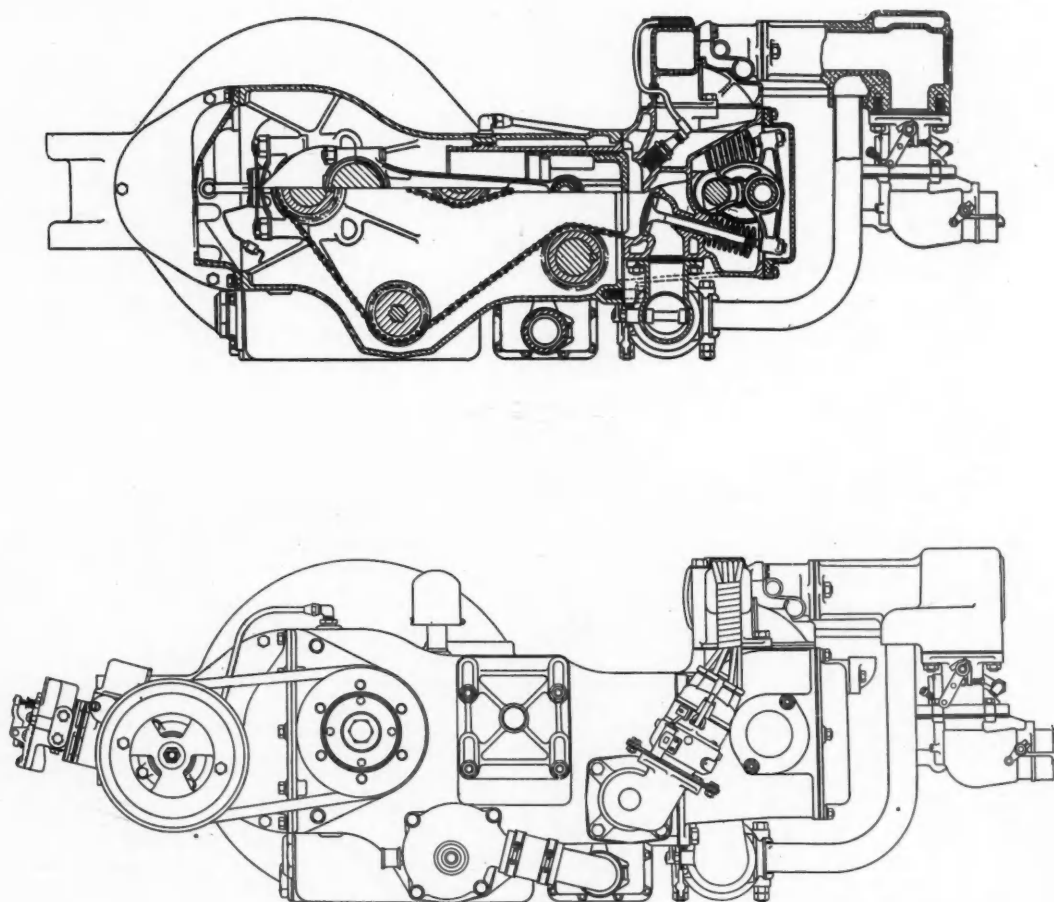
No. 46 in the AUTOMOTIVE INDUSTRIES
Engineering Drawing Series

Hall-Scott Horizontal

180 Hp. Engine

The valves of this engine are located at an angle in the cylinder head and are actuated through rocker levers from an "overhead" camshaft which, together with the accessories, is driven from the crankshaft by chain. From the sectional view it will be seen that the engine has "wet"

cylinder liners. Most of the accessories, including the air compressor, are located at the forward end. A Handy governor is included in the equipment. The carburetor is mounted in a very accessible position at the head end of the engine.



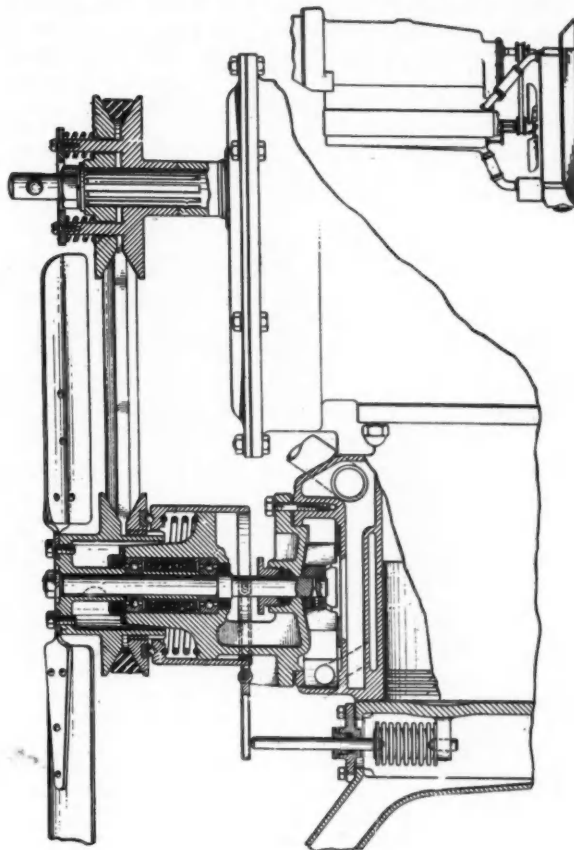
Speed of Fan Controlled

AS long as the water in the cooling circuit of an automobile engine is cold there is no need for an intensive air flow through the radiator. In fact, fan action under these conditions may be detrimental in that it absorbs power unnecessarily and in that it tends to cool the water still further, possibly with deleterious effects on the efficiency of the engine and on its life. Many attempts have been made to control the speed of the fan in accordance with the temperature of the jacket water, and one method has been covered in a patent issued to Clyde R. Paton. Referring to the drawing, the fan is driven by a V belt. A loose flange of the driven pulley is forced in the direction toward the tight flange by a coil spring acting directly on a cylindrical shell, between the head of which and the loose flange there is a ball thrust bearing. The cylindrical shell is acted on also by a syphon-type thermostat in the outlet from the engine jacket. As the cooling water becomes heated, the syphon expands and tends to withdraw the cylindrical shell. This allows the flanges of the pulley on the fan to recede from each other, so that the belt runs closer to the fan axis, giving the effect of a

pulley of smaller diameter. The flanges of the driving pulley are simultaneously pulled together by coiled springs, giving the effect of a driving pulley of larger diameter. With a larger driv-

ing and a smaller driven pulley the speed of the fan is increased.

Patent No. 2,045,870. Internal-Combustion Engine. Clyde R. Paton, Detroit, Mich., assignor to Packard Motor Car Co.



Details of the Paton device for fan speed control

Chalmer's Inertia Transmission Patent

IN the paper on Automatic Transmissions read before the Philadelphia Section of the S.A.E. last February, and which was printed in *AUTOMOTIVE INDUSTRIES* of April 10 and 17, mention was made of the Hobbs inertia transmission which is being built in England. It has been called to our attention by Henry B. Chalmers of Babylon, L. I., N. Y., that U. S. Patent No. 1,860,383, issued to him on May 31, 1932, covers a transmission practically identical with the Hobbs transmission in principle.

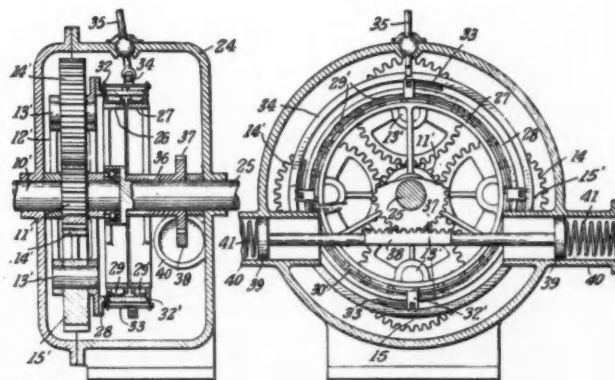
The drawing shown herewith is reproduced from the patent mentioned. The crankshaft 10' carries a pinion 11 rotating with it and driving the inertia pinions 14', which latter carry eccentric inertia masses. As the pinions with these eccentric masses rotate, they impart impulses to the frame 12' which tends to move it first in one direction

about the axis of shaft 10' and then in the opposite direction, so that frame 12' receives oscillating impulses. The impulses in one direction are communicated through frame 12' to flange 28, clutch rollers 29 and driven wheel 26 to driven shaft 25, while impulses in the opposite direction pass from clutch rollers 29' to the damping pulley 27, gear wheel 37 and rack 38 to the dashpot pistons 39 centered in dashpots 40 by springs 41. The direction of the

impulses delivered to the driven shaft depends on the position of the reversing mechanism, which moves the clutch rollers 29 and 29' in relation to the masses in flange 28 by means of roller retainers 30 and 30', fingers 32 and 32', reversing ring 34, and reversing lever 35. Thus this automatic transmission included a reversing gear.

Mr. Chalmers also has three other U. S. patents on automatic transmissions of other types.

Patent drawings of the Chalmers transmission



TOOLS OF TOMORROW

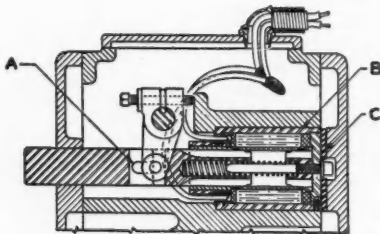
(Continued from page 379)

elastic motion parallel to the motion of the hydraulic cylinders.

Accurate die alignment is, for example, very important in the manufacture of clutch discs from powdered material. The discs must be of uniform thickness. Some of the airplane brake linings manufactured by the S. K. Wellman Co. have a finished thickness of 0.015 in. with a tolerance on thickness of only 0.001 in. without machining.

A larger press frame of 3000 tons capacity was designed by Lukenweld, Inc., and installed late in 1935 in the plant of the S. K. Wellman Co. The band on this press was made from two steel plates, 169 3/4 in. in length, 50 in. wide and 3 in. thick. Center to center distance of the radii on the end bands is 7 ft. 2 1/2 in. and the frame is 12 ft. in height, 50 in. in width and 50 in. between uprights.

In the 3000-ton equipment it was decided to work the hydraulic mechanism at 6000 lb. per sq. in. This pressure exceeds usual commercial practice. However, by using high strength alloy steels, and a newly developed welding technique, it has been possible to pro-



Cross section of Kingsbury solenoid mounted to trip the Kingsbury drilling head. Among the features of the unit are: A. slotted shoe which allows plunger to gain momentum before picking up load; B. conduction cooling; C. synthetic rubber bumper which absorbs impact of plunger

duce a 35-in. hydraulic cylinder which will withstand, without leakage, an oil pressure of 6000 lb. per sq. in.

October, 1935, Stewart Bolling & Co., Inc., Cleveland, Ohio, built a 2100-ton hydraulic press of similar design, utilizing a welded frame fabricated by Lukenweld, Inc. This frame, shown on page 379, consists of two steel plates, measuring 156 1/16 in. long, 32 in. wide and 3 in. thick, forming the band. The overall dimensions of the frame are 10 ft. 10 in. in height, 32 in. in width and 40 in. between uprights. The equipment is installed in the plant of a prominent Detroit automobile manufacturer and is used in cold molding special compositions in shapes and forms. The installation is shown in the photograph reproduced on page 379.

According to a statement by Lukenweld, the design of the continuous welded frame type of press is applicable to all hydraulic pressing problems. It

embodies not only the basic improvement of equalizing the strain on the tension members but also eliminates the problem of deflection since it places the platen predominantly in compression. The factor of safety has been increased, and generally first cost is lowered. These basic improvements are applicable to both moving cylinder and moving ram types of presses, and hence to all forms of hydraulic pressing as well as to presses of any size or tonnage.

Solenoid

... A.C. unit made by Kingsbury machine tool applications

Kingsbury Machine Tool Corp., Keene, N. H., is offering a new A.C. solenoid for application to machine tools and has equipped a department to manufacture the unit in quantity. The solenoid detailed in the accompanying sketch is shown arranged to trip the head of a Kingsbury drilling machine.

Small, compact, and balanced magnetically, this unit is made in cylindrical shape to facilitate its mounting. The coil is wound on a phosphor-bronze coil bushing, between bobbin heads molded of a high strength material. Cotton interweave used in the winding is impregnated to provide high electrical and low thermal insulation. The coil is mounted in a steel case which protects it from mechanical injury and forms a magnetic shield.

As stated by the manufacturer, the slotted solid plunger and pole piece construction permits economical redistribution of iron in the magnetic circuit to effect variation in the character of the pull curve to meet individual requirements.

Basic design of the solenoid is such that variations in design may be readily incorporated to adapt the unit for special requirements of different applications. The variable factors include the average pull, possible duty cycle, effective stroke, type of pull curve, and method of connecting the load.

N. J. Vehicle Law Revised

Revised section 7 of the New Jersey Motor Vehicle Act will be enforced "rationally" until such time as the Department of Motor Vehicles furnishes approved lists of the car accessories specified in the section.

The new section makes a number of definitions and rulings on the lighting, reflectors, horns, brakes and other equipment of motor vehicles.

STAINLESS STEELS

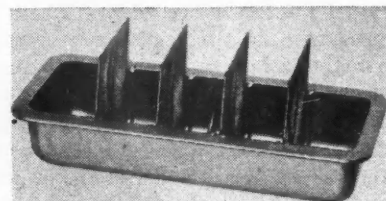
(Continued from page 390)

Production characteristics peculiar to the manufacture of stainless steel include very high refining temperatures and exacting control of atmospheric conditions in the furnace. These two

Oil Cleaner

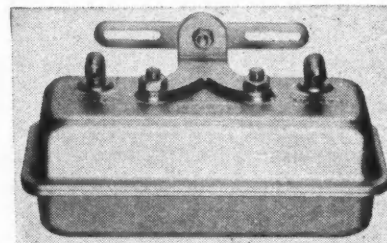
for internal-combustion engines . . . is readily accessible for servicing

A new oil cleaner for internal-combustion engines has been placed on the market by Permanent Oilfilt'eer, 4155 West Cullerton Street, Chicago. It consists of a pressed steel housing made in halves, containing a series of wire screens through which the oil is forced. The filtering screens divide the interior



Lower part of Oilfilt'eer, showing filter elements and settling basins

of the case into five compartments. The oil from the engine enters the filter at the left (in the illustration above) and passes successively through vertical screens of 40, 50, 60 and 80 mesh. Owing to the large transverse section of the filter, the oil passes through the compartments at low velocity, and dirt particles have a chance to settle to the bottom of these compartments. The



Assembled Permanent Oilfilt'eer

larger particles of dirt are caught by the first fairly coarse screen, while the finer particles are caught by the succeeding finer screens. The oil leaves the filter at the top, so that the sediment at the bottom of the filter is not disturbed.

This filter can be readily cleaned and replaced on the engine. When installed on a new engine, the filter should be removed and cleaned at the end of 20,000 miles, according to the recommendations of the manufacturer, whereas when the filter is installed on an old engine it is advisable to inspect and clean it after a few thousand miles.

out eliminating too much chromium.

For this type of steel, the charge consists essentially of ordinary low-phosphorus, steel scrap of a low-carbon, open-hearth variety. If the carbon content is too high for good stainless steel, the carbon must be reduced to less than 1 per cent by raising the temperature and burning it out. When the carbon content is lowered by this means, chromium is introduced by the addition of a ferro-chrome of a grade having somewhat less than 1 per cent carbon.

While it is possible to produce high temperatures with both the electric furnace and the open-hearth furnace, with the latter there is likely to be excessive wear. High temperatures tend to ruin the refractory linings and, as these are more intricate in the open hearth, this immediately becomes an important cost factor. As to the relative merits of the two processes, this is mainly a matter of "which furnace can withstand the necessary high temperatures and hold up so that maintenance costs will be a minimum."

The chief incentive to the production of stainless steel in the open hearth furnace is the possibility of turning out large tonnages. The two modifications mentioned above, the K. M. Simpson and E. Bosshardt types, have one thing in common. In both of these open-hearth furnaces the flames are so directed that the maximum heat is concentrated on the bath, while the refractory-lined roof and the firing ports are not exposed to such high temperatures.

The Simpson-type furnace is similar in design to the conventional open hearth, with the exception that heating is accomplished by means of about seven fuel-oil or coke-gas burners, which are inserted through the roof and direct their flames directly on the bath. The use of a considerable number of burners makes possible combustion of a relatively large amount of fuel in a small space and in a short time. Advantages claimed are efficient heating at high temperatures, with much less wear and tear on the refractory lining, as compared with the conventional open hearth furnace.

The other type was brought to the attention of the engineering world in 1923 when Edwin Bosshardt, of Berlin-Tempelhof, Germany, filed a patent on his open-hearth furnace for melting stainless steels. He obtained U. S. patents on the device four years later. Then American and Canadian rights to the patents were secured by Oliver J. Sorg, and finally these patents were assigned to the Barium Stainless Steel Corp., Canton, Ohio. Later the Barium Co. was licensed by the Chemical Foundation and today is producing

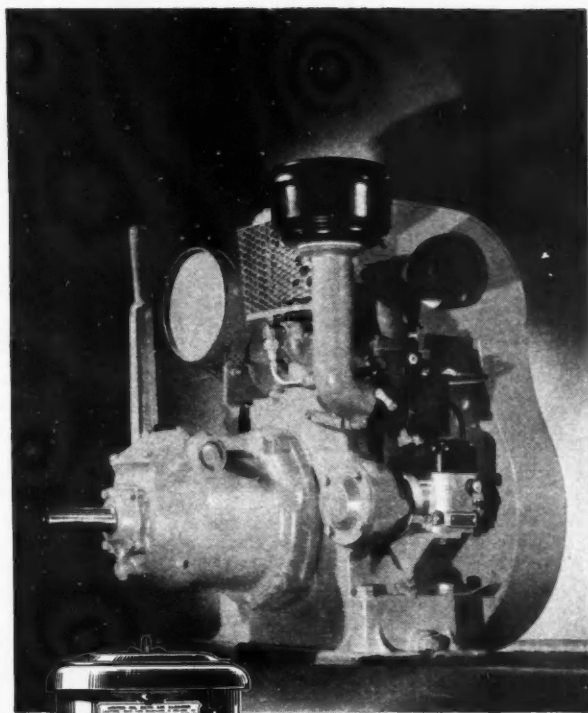
stainless steels in the Bosshardt open-hearth furnace.

Stainless steels can be deep drawn, spun, machined, stamped, welded, soldered, brazed, riveted, forged, cast, punched, sheared and bent. They can be fabricated like any low-carbon iron or steel, provided proper practice is followed.

When fabricating stainless steels by welding is considered a distinction must be made between the two main classifications; the straight-chromium and the chrome-nickel groups. Steels in the first group do not respond well to heat treatment and have a tendency toward

grain growth under the influence of high temperatures. If proper welding procedure is followed by an 8-hr. anneal at approximately 1450 deg. Fahr., they can be somewhat softened. How much, depends to a large extent on the welding process. Inasmuch as welded alloys of this type are not very ductile, they are generally unsatisfactory for services where they will have to withstand shock at room temperatures.

The second group is very tough in the as-welded state and can be fabricated by any commercial welding process in use today, with the exception of forge and fire welding.



Standard equipment on several models of Briggs & Stratton, Stover and Wisconsin small one-cylinder engines.



PROTECTION FOR SMALL ONE CYLINDER ENGINES

Abrasives entering carburetor of small one-cylinder engines cause same kind of destructive wear as occurs in car, truck and farm tractor motors when operated under similar conditions. Garden tractors, power lawn mowers and small one-cylinder engines, used for industrial purposes, need same engine protection as provided for larger engines.

Dust from a little garden, from a dry golf course or parkway, or from a coal yard or oil field is just as abrasive as dust laden air from a million acres. Owners of small engines which operate in abrasive dusts can less often afford excessive engine wear than can operators of larger power equipment.

When you buy small engines of this type insist that they be protected with UNITED Oil Bath air cleaners—just good insurance against excessive engine wear.

UNITED AIR CLEANER CO.

Division of UNITED SPECIALTIES COMPANY

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Chicago, Illinois

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HOTEL CLEVELAND

Cleveland

September 18, 1937

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- 3 Zenith Filters have no cartridge or packing to replace, no screen to be damaged.

ZENITH Fuel Filters are completely different in principle from other filters. Not just another wire screen device, not a short-lived packing-and-cartridge proposition, but a scientifically built filtering mechanism with patented and exclusive features. It can't get out of order, it can't wear out, it requires no servicing other than cleaning—and that, rarely!

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That's why leading car and truck manufacturers—such as Buick, International, White and GMC—have Zenith Filters as original equipment.

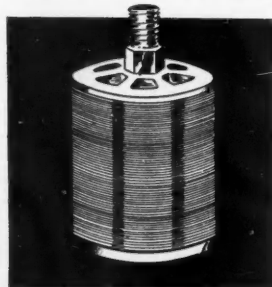
Zenith Fuel Filters are made in types to fit almost every mechanical fuel pump. They are inexpensive and easily cleaned. For information and prices—request our representative to call.



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